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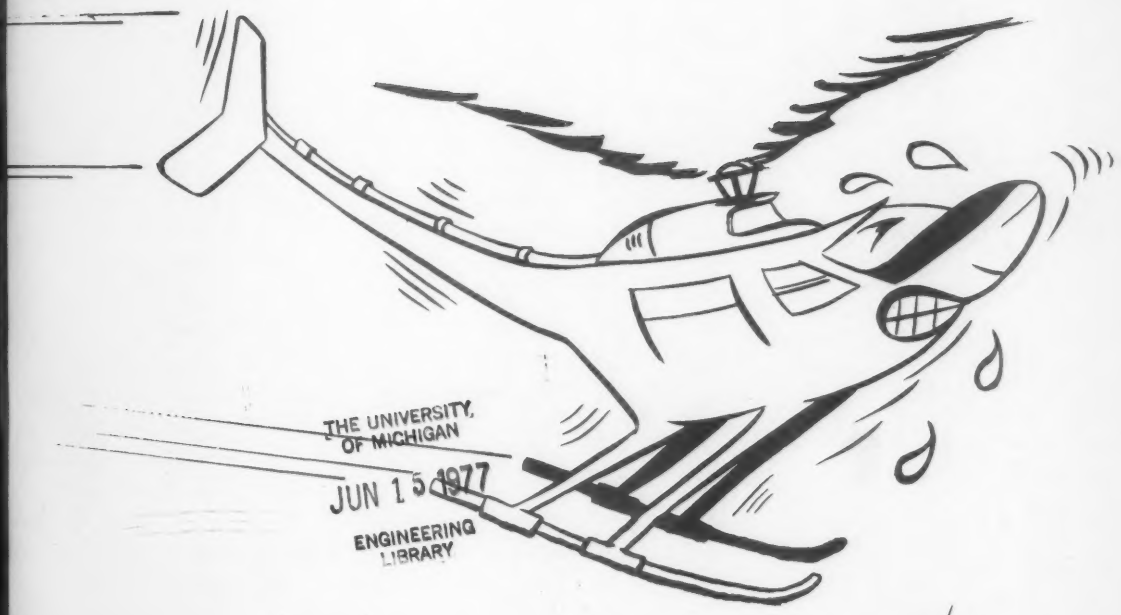
UNITED STATES ARMY

AVIATION DIGEST

MAY 1977



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See Dash 10 Corner "Maximum Performance" page 6

and "Optimizing Takeoffs Of A Heavily Loaded Helicopter" page 7

JUN 10 1977

UNITED STATES ARMY AVIATION DIGEST

MAY 1977 VOLUME 23 NUMBER 5

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ABOUT THE COVER

The *DIGEST* thanks Mr. Bill Totty of USAAAVS for this month's cover art

The mission of the *U.S. ARMY AVIATION DIGEST* is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

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Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, *U.S. ARMY AVIATION DIGEST*, Fort Rucker, AL 36362.

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VIEWS FROM READERS

Sir:

I would like to know if I may obtain a subscription of the *U.S. ARMY AVIATION DIGEST*?

I was in the service during the Korean War. I am just interested in the magazine and would like to follow their (the Army's) progress.

Eldo Chandler
Fremont, Nebraska

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Sir:

This is a preliminary announcement of the 48th Shock And Vibration Symposium to be held 18-20 October 1977 at Huntsville, AL. The U.S. Army Missile Command is host.

This meeting will be held at the Von Braun Civic Center. Contributed papers relating to the many aspects of the mechanical shock and vibration technology are solicited. Limited distribution and classified papers up to and including secret are encouraged. No specific session topics have been chosen; however, plans are being formed and suggestions for topics

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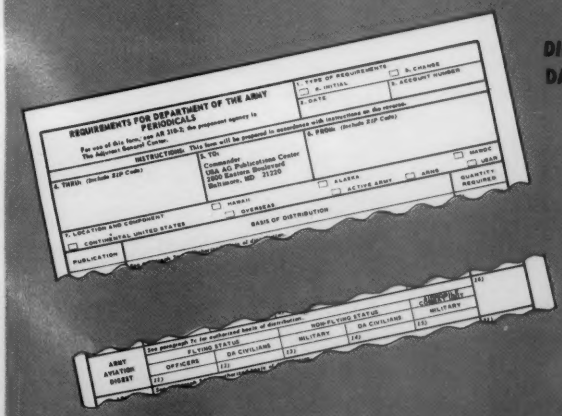
MISSING THE DIGEST?



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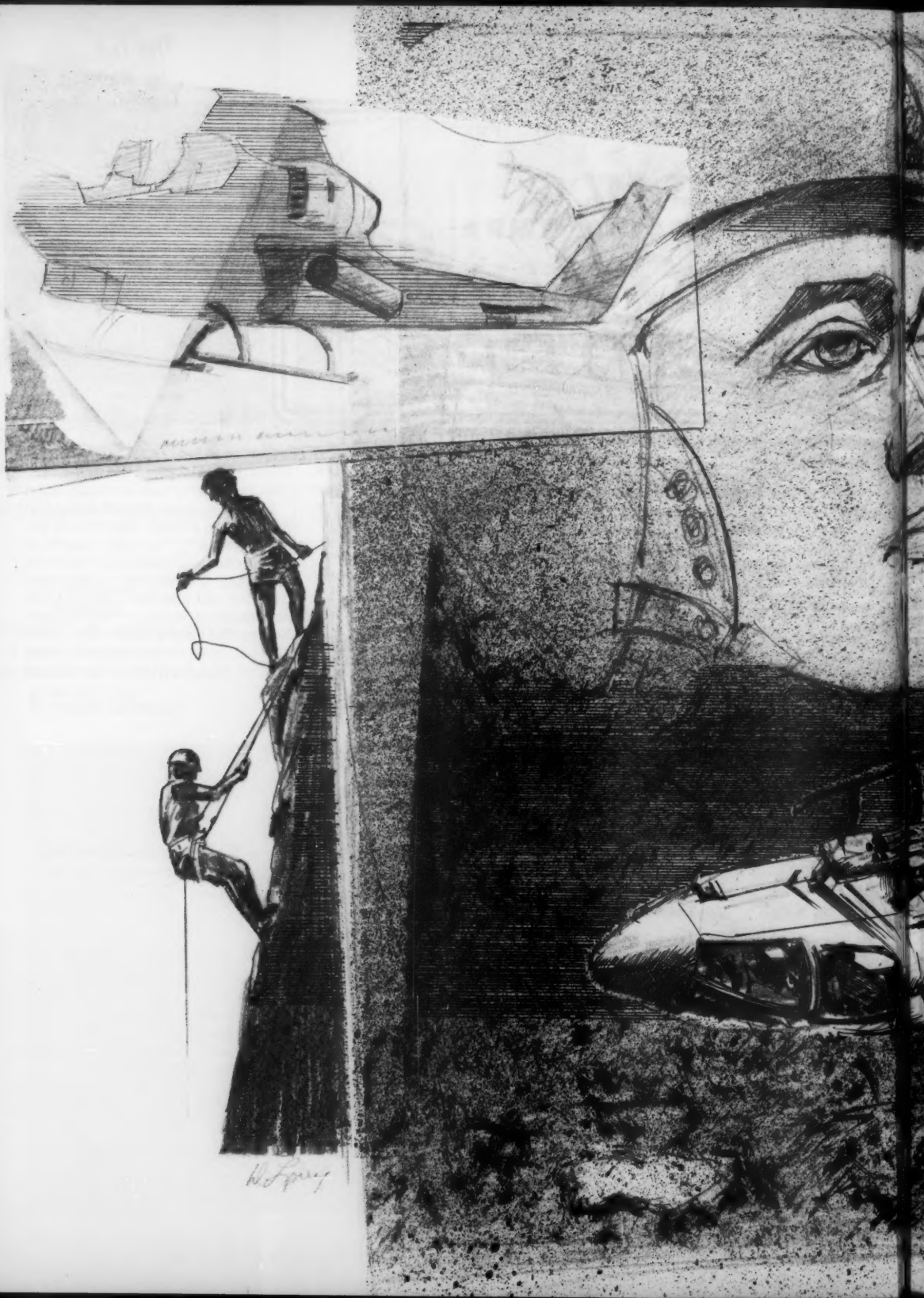
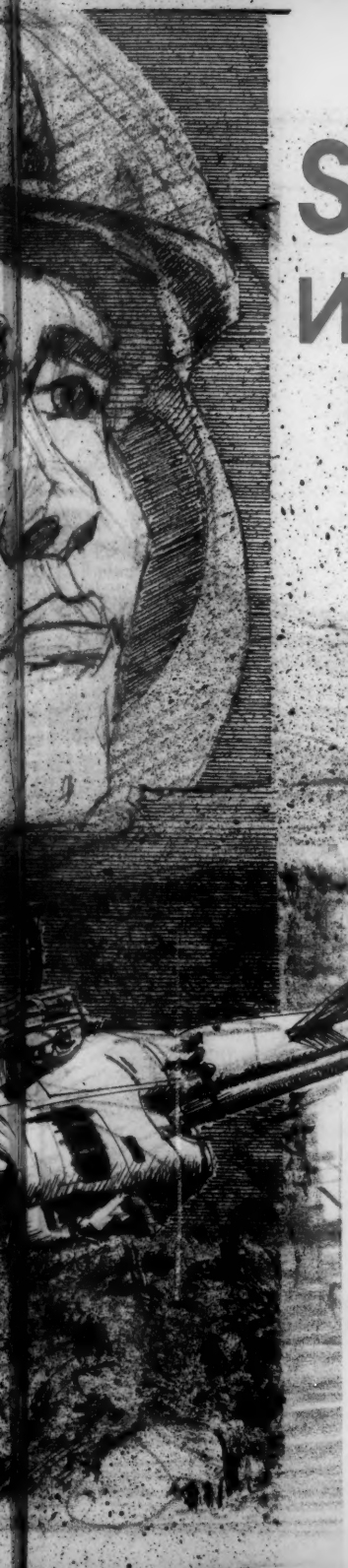
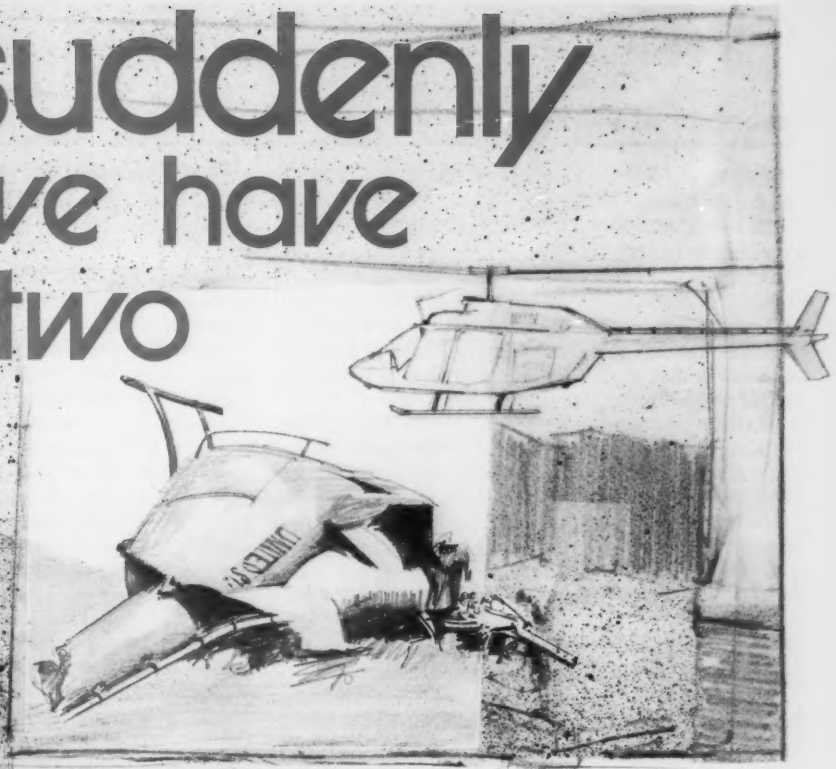
The Adjutant General Publication Center has stipulated that the basis of distribution is one copy per each two military and civilian personnel on flying status; one copy per each four military and civilian personnel in nonflying status but directly associated with Army aviation, i.e., maintenance, air traffic control, air staff section, etc.; one copy per each twenty personnel assigned to air mobile combat units.

If you qualify send in a DA Form 12-5 and the magazine will start coming posthaste.



suddenly we have two





Arnold R. Lambert
Publications and Graphics Division
U.S. Army Agency for Aviation Safety

CAPTAIN HARDIN was assigned as leader of a flight of four Cobras. The mission would take them across a high mountain range and Hardin briefed the other crews on the weather and the flight route.

The crews prepared for the flight and CW2 Leatherwood went through the preflight with his copilot, grumbling all the while, "This must be our lucky day. Old Hardhead Hardin is going to lead us through the clouds and over the mountains. Just look at those clouds. If I had any say-so we wouldn't go, but Hardin says we'll find a hole and get through."

The flight took off in loose trail formation with Leatherwood in the Chalk 4 position. Only a few miles out, the flight encountered clouds and Hardin decided to go around the mountain range to remain VFR. Leatherwood started grumbling again. "Well, we can forget the part of the briefing about the route we'll take. Old Never-Give-Up Hardin is looking for a hole."

Chalk 4 was climbing about 800 feet a minute using 40 pounds of torque and at an airspeed of about 70 knots. As the flight continued around the mountain, Leatherwood realized he was falling behind. He called Hardin twice and told him that he couldn't keep up. His calls were acknowledged but Hardin took no action to wait for him. At this point Leatherwood was several miles behind and decided that he couldn't play follow-the-leader if he didn't know where the leader was.

At that moment something on the side of the mountain caught his eye. He moved in for a closer look and saw a party of mountain climbers. He noticed that the climbers were linked together with rope and the separation was about the same between them. The copilot commented to Leatherwood, "Maybe if we had tied a rope to Chalk 3 we wouldn't be so far behind now."

Their climb rate had dropped to 400 feet a minute, the airspeed was 50 knots, and the N1 was 98.8 percent. Their altitude was over 12,000 feet but they were only 150 feet agl when Leatherwood started a gentle right turn to get a closer look at the climbing party. The terrain arose abruptly in front of him and he decided to go over it instead of turning downslope or continuing the right turn upslope. As they approached the top of the rise, the Cobra leveled, the rate of climb stopped, and engine rpm was about 6350. Leatherwood initiated a cyclic climb and managed to gain a few feet in altitude, but the airspeed fell rapidly. The rpm continued to decrease and as Leatherwood turned downslope with a quartering tailwind of about 25 knots he noticed that the controls were sluggish.

He made a MAYDAY call when the aircraft was 50 feet agl and sinking at a rate of 350 feet per minute with a forward airspeed of 10 knots. The Cobra crashed and came to rest on its left side with the canopy on the ground. Leatherwood saw his copilot lying against the canopy and decided not to use the canopy removal system. He started to chop his way out with a breakout knife. Without warning, the copilot exploded the canopy and Leatherwood blew his cool. As the two pilots walked away from the wreckage, Leatherwood started again. "I hope old Hardhead is satisfied ... I knew this flight should have been cancelled ... I'll bet that MAYDAY call rattled his cage."

CPT Hardin was several miles away in the lead aircraft and heard the call but had no idea where Chalk 4 was. He called the airfield and then started a search nearly 4,000 feet below the actual crash site.

Meanwhile, back at home base a new chain of events, with another aircraft and another set of characters, had begun.

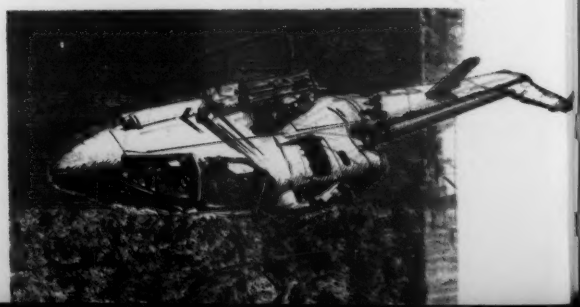
After hearing about the Cobra crash, the unit commander, MAJ Swanson, decided to fly to the accident site. He called the airfield. "This is Major Swanson. Is the medevac bird still there? Well, where is it? Weathered in! What is it doing down there? Well, check your SOP and show me where it says that a medevac helicopter is to be used for picking up communications equipment." The major slammed the phone down and left the office.

He arrived at the airfield with a doctor and CW2 Broxton, an OH-58 pilot, and they prepared to join in the search and rescue. A walk-around inspection and engine runup were made without a checklist and they took off, climbing east-bound around the mountain range.

Shortly after takeoff Broxton made contact with another OH-58. "Has the downed Cobra been located?" The pilot of the other OH-58 responded, "That is affirmative. I left my copilot at the crash site and I have the Cobra pilots with me. They appear to be uninjured but one of them keeps grumbling about not being picked up sooner. He says he could have bled to death in the 45 minutes he waited for us."

Even though the emergency no longer existed, MAJ Swanson wanted to continue to the crash site. Broxton continued to fly around the north side of the mountain range heading in a westerly direction. They failed to find the crash site while flying west so they turned around and continued to climb easterly toward the top of the mountain.

They finally spotted the wreckage as they con-



Cobra crashed with forward airspeed of 10 knots

tinued flying upslope. Their airspeed was low, about 20 to 30 knots, and Broxton thought he was flying downwind, but he was actually flying into the wind. He started a shallow right turn and rolled out of the turn to a heading of 240 degrees. As he stopped the turn, the aircraft yawed sharply to the right and shuddered. Directional control was lost as Broxton ran out of left pedal. He decreased collective pitch to regain directional control and the aircraft continued to settle. They were about 10 feet agl over rough terrain with no available safe landing area. Broxton increased collective and immediately lost directional control again. The aircraft rotated 360 degrees as the rpm warning light came on and the audio sounded. The OH-58 crashed and came to rest on its left side. All three men escaped uninjured. A little more than an hour had elapsed since the Cobra crash.

After being checked and released from the hospital, all the aviators involved assembled at the airfield. Leatherwood was still grumbling. "In the first place, the premission briefing didn't include alternate flight routes, minimum and maximum altitudes en route, or minimum and maximum separation en route. We should have computed weight and balance and the performance characteristics for each aircraft before we took off. And in the second place, with the clouds the way they were, we shouldn't have been up there in the first place."

CPT Hardin had been listening and trying to maintain his composure. His face turned a deeper shade of red with each second and finally he lashed back at Leatherwood. "Yes, and in the third place, if you hadn't been buzzing those mountain climbers maybe you would not have gotten into a position where you had to demand more power than your aircraft could deliver."

At this point MAJ Swanson raised both hands and yelled. "All right, hold it, you guys! There seems to be a lot of us with egg on our faces and I'm guilty, too. We haven't had an accident in well over a year and now, suddenly, we have two. It looks as though we have a complacency epidemic because a lot of mistakes were made here today. And I'm afraid we are going to have some red faces when the accident investigation boards get here and start asking questions. Since we operate primarily in the mountains, they will no doubt concentrate on density altitude and weight and balance as possible cause factors. They will want to know why we failed to compute the performance characteristics for the weight configuration of each aircraft before departure. They will also want to know why our weight and balance forms are not up to date and accurate.

"And Captain Hardin, they are going to ask you why you didn't call the mission off when you encountered clouds at ground level; why you didn't supervise your flight more closely; and why you ignored Leatherwood when he told you twice that he could not keep up." A smile came to Leatherwood's face but quickly disappeared when MAJ Swanson turned to him. "You can be sure they'll want to know why you were buzzing those mountain climbers instead of trying to follow your flight leader."

Broxton spoke up. "Sir, we had an emergency situation and we didn't have time to file a flight plan, or go through the checklists for preflight and engine starting and runup. And we didn't have time to compute weight and balance or performance characteristics. Those Cobra pilots could have been injured and time was important."

The major agreed. "Maybe so, Broxton, but then we'll have to explain why we didn't return to the airfield when we heard that the Cobra pilots had been picked up. And it will also be difficult to explain why the medevac bird was not available when it was needed."

Swanson continued. "Do any of you know the OH-58 pilot who picked us up from the crash sites?" Leatherwood responded. "Sure, it was the new guy/what's his name." "Yes, well what's-his-name, as you call him, has less mountain flying experience than any of us. We are supposed to be the pros, the experienced, the hot shots – yet a rookie 'mountain' pilot rescued us from the mountaintop and do you know why? I'll tell you what I think. I think he has a healthy respect for mountain flying and he takes every precaution to keep from getting into trouble. I'll bet he knows the dash 10 from cover to cover and that makes him more of a pro than a rookie. We don't have to wait for an accident investigation board to tell us what's wrong. Let's shape up now before our complacency gets us all killed."

The telephone rang and Leatherwood answered it. Without saying a word he put it down again. He left the room grumbling. One of the accident investigation board members had arrived and wanted to talk to him about a Cobra.

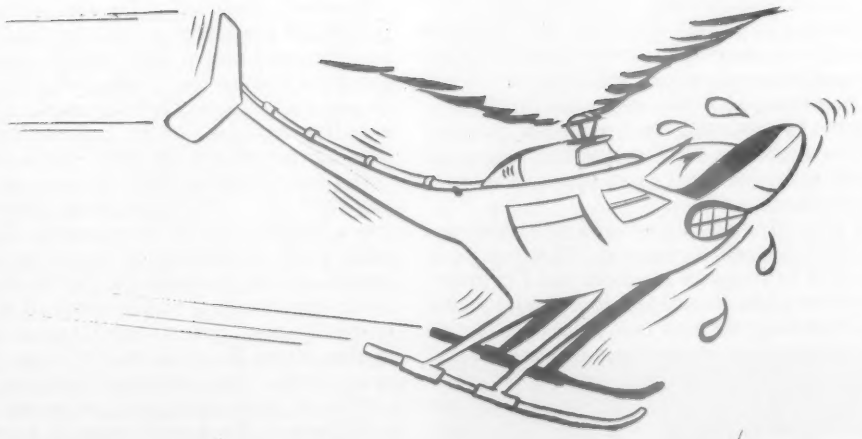
-10 CORNER

MAXIMUM PERFORMANCE

TO ARMY helicopter aviators, the term "maximum performance" has for many years been associated primarily with barrier clearance takeoffs.

In fact FM 1-5, "Rotary Wing Flight," defines maximum performance takeoff as "... in reality ... a maximum angle takeoff." Maximum performance, so far as the helicopter is concerned, is not a maximum angle climb but is the demand for maximum power at any time during takeoff, hover, climb or cruise.

This brings us to the two maximum performance takeoff techniques that are described in new Army helicopter operators manuals (dash 10). (Refer to paragraphs 8-33 through 8-36, TM 55-1520-234-10.) Both techniques, coordinated climb and level acceleration, are used to clear barriers in the departure path – each one offering some advantage over the other. The article entitled "Optimizing Takeoffs Of A Heavily Loaded Helicopter" on page 7 of this issue of the *AVIATION DIGEST* explains some distinct performance advantages resulting from using the level acceleration techniques.



Optimizing Takeoffs Of A Heavily Loaded Helicopter

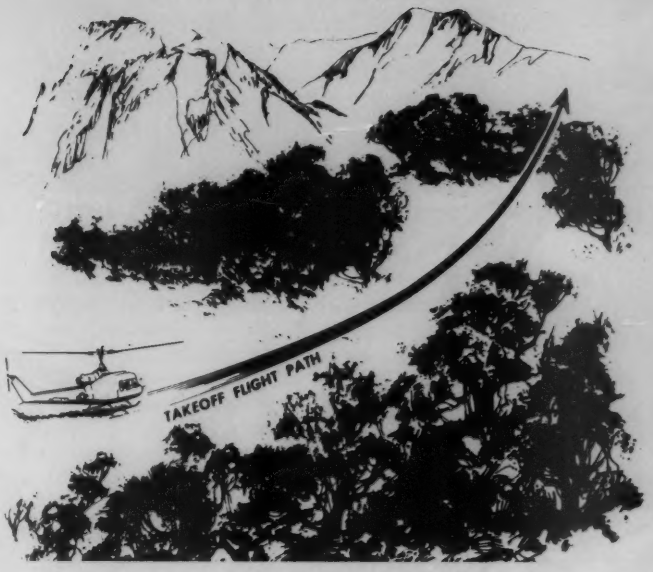


Figure 1. Heavily loaded takeoff from a restricted area

The data for this article are based on flight tests conducted in UH-1B and C helicopters. Even though these two helicopters are no longer the Army's firstline aircraft, the principles set forth are applicable to all single main rotor helicopters

LTC James A. Burke **Dr. Fredric Schmitz** **Mr. Rande Vause**

U.S. Army Air Mobility R&D Laboratory
Moffett Field, CA

HOW MANY TIMES have we as Army aviators been confronted with a takeoff situation from a confined area in which the helicopter load and ambient temperature made us "more than uncomfortable"? Then, after a general assessment of the helicopter's performance and a decision to "go," how many times have we seen our barrier come too close?

One might ask, "How important is technique related to obstacle clearance?" Well, it turns out that the pilot technique related to power and attitude management can, in fact, help us to clear a takeoff barrier by a much greater margin.

An application of an optimized takeoff technique has been confirmed by the U.S. Army Air Mobility Research and Development Laboratory, Moffett Field, CA. In this case, optimal control theory has been applied to an experimentally verified mathematical model of a heavily loaded helicopter operating in ground effect in order to develop a simple, near-optimal takeoff control policy. Primary emphasis is placed on understanding the physical tradeoffs and implications involved in the takeoff technique.

The significant results include the development of a two-segment, near-optimal control technique for heavily loaded helicopters exiting from a confined area and also, a means of estimating, from hover

Continued on page 18

HELICOPTERS
IN AERIAL COMBAT

The data and opinions presented in this article are solely those of the author and in no way imply endorsement by the Department of Defense

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Fort Rucker, AL

...it does not make good sense to rule out the possibility, or even the probability, that opposing attack helicopters will meet on the battlefield...

LATE IN JULY of 1915, Captain Lanoe Hawker of the British Royal Flying Corps took off in his Bristol Scout aeroplane armed with a cavalry carbine mounted on the starboard side of the fuselage. It was pointed outward at an angle to ensure that the bullets would clear the propeller. Somewhere over the Ypres salient, flying with one hand and firing with the other, Hawker attacked three German aircraft, shooting down two.

Captain Hawker's exploit was considered so remarkable at the time that he was awarded England's highest decoration for valor, the Victoria Cross. Thus began a new chapter in the long history of nations in conflict. A whole new dimension was added to the land battle. Never again would wars be fought strictly on the ground or sea. Domination of space over the battlefield has since been hotly contested. This will continue to be the case in any future conflicts – and the helicopter will play a key role neutralizing enemy airpower.

Following World War I, the implications of air power were so enormous that, on hindsight, it seems incredible that they were lost on all but the losers. Yes, like the tank, most nations considered the fighter plane to be a passing fancy. Those nations, including our own, did little to develop either the hardware or doctrine for air combat. Many nations learned, at great expense, what the Germans realized early: speed, mobility, surprise and shock could provide the means for a numerically inferior force to decisively defeat a less flexible opponent.

It was not long before still another dimension was added to the battlefield. Another dimension, you ask? Yes, the helicopter is another dimension. It is neither fish nor fowl; it is an air vehicle which operates in a terrain environment. Yet, it does *not* conform to the rather predictable patterns and movements of either fixed wing aircraft or ground vehicles. The helicopter has a maneuverability advantage over both. The helicopter's speed and maneuverability differential makes it clearly unique. So, whether it is considered as a weapons platform, or a target, the helicopter can only be codified as in a class by itself.

During World War II the helicopter was employed in the medical evacuation role in the CBI (China, Burma, India) theater of operations. This mission was greatly expanded during the Korean War, and other combat roles such as reconnaissance, liaison and adjustment of artillery were performed by helicopters.

In the late 50s and early 60s the concept of airmobility bloomed. The helicopter quickly proved its combat worth by moving troops and weapons around the battlefield both in maneuvers and in Vietnam action. The helicopter freed ground troops from the terrain while, at the same time, increasing the tempo of combat operations.

As is usually the case when new ingredients are introduced to the broth of battle, the whole menu was disturbed. This new ingredient was fragile and had to be protected. Fighter aircraft were inappropriate for the job, so attack helicopters were quickly improvised for this purpose. Attack helicopters soon were validated in the armed escort role and became fundamental to nearly all ground combat operations.

It always has been axiomatic that, when one nation develops a new weapon and subsequently proves its viability, other nations must find a way to counter, copy or improve it; preferably, all three. The Soviets always have been good students with long memories. They have proven to be no less astute in the area of attack helicopters.

According to more than one leading military journal, the Soviet forces facing NATO (North Atlantic Treaty Organization) already have a considerable force of advanced attack helicopters and are expected to double the number of operational Mi-24 Hind attack helicopters by the end of 1978. The Hind has a gross weight of about

Continued on page 28

The author currently is working on TC 1-7, "Helicopter Aerial Defensive Tactics." He would be interested in hearing from you about how you see the helicopter in this role. Write to the author at P.O. Drawer P, Ft. Rucker, AL 36362 or call him at commercial 205-255-4603 or AUTOVON 558-4603

COL Richard D. Kenyon
Project Manager
Utility Tactical Transport
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St. Louis, MO

Production Started on the UTTAS HELICOPTER

WHAT'S NEW IN Army aviation? The Utility Tactical Transport Aircraft System (UTTAS) is entering production, that's what! Visible improvements in air-mobile capabilities are seldom obvious. Because of the cost and lead time involved with such changes, we are accustomed to seeing various modifications to existing aircraft to provide incremental improvements in capability rather than a totally new vehicle for a quantum upgrading. The incorporation of the UTTAS UH-60A into the Army force structure will be visible and have a profound effect on Army aviation for many years.

During the last stages of Vietnam the Army defined utility helicopter mission needs of the 1970s and desires for the 1980s to include validated advancements in technology to produce the Utility Tactical Transport Aircraft System (UTTAS) description. In 1972 two prime contractors – Sikorsky Aircraft of Stratford, CT, and Boeing Vertol of Philadelphia, PA – were funded to competitively develop prototype UTTAS vehicles for parallel Government evaluation. The General Electric Company of Lynn, MA, also was funded to develop a totally new powerplant specifically designed for a twin engine rotary wing installation. (See the May 1976 *AVIATION DIGEST.)*

Three aircraft from each contractor were then subjected to a rigorous evaluation, including a total of nearly 3,000 hours of flight test to establish the vehicles' specific capability and confirm the mission description. This is broadly categorized as development testing and operational testing.

Development testing included instrumented engineering test flights by the contractors from November 1974 through March 1976. It explored the flight envelope and established basic system airworthiness. Subsequently, detailed performance and specification compliance testing was accomplished by the Army Aviation Engineering Flight Activity using facilities at Edwards AFB, CA; Ft. Wainwright, AK; and the Eglin AFB Climatic Hangar, FL. While that testing was underway, an independent test group from the U. S. Army Test and Evaluation Command (TECOM) flew each configuration aircraft about 300 hours to assess reliability, availability and maintainability (RAM) of the vehicle as well as its suitability vis-a-vis desired system characteristics.

For operational testing TECOM, using personnel of the 101st Airborne Division (Air Assault) at Ft. Campbell, KY, was equipped with each of the UTTAS candidates as well as the standard UH-1 Huey aircraft. For a 3-month period this organization flew each type aircraft about 250 hours in a sustained simulated tactical environment. While development testing is conducted from permanent engineering type facilities using trained experimental test personnel, the operational test was conducted with a typical combat unit in a remote site without benefits of paved surfaces or sheltered maintenance facilities.

The objective of this test was twofold; to assess the operability of the aircraft system as compared to the existing baseline helicopter (the UH-1) in the tactical scenario and to provide information on the adequacy of the current tactics/doctrine and organization for effective employment of the UTTAS. As can be imagined, this latter effort is equivalent to the "acid test" and goes far beyond the characteristics of the vehicle per se. It evaluates the compatibility of the aircraft's design concept and support package with operational demands, e.g., does the configuration lend itself to maximum mission flexibility, maximum safety, low detectability and ease of maintenance under field conditions.

This test turned out to be more realistic than planned since the weather during the evaluation period at Ft. Campbell varied the operations sites from a "sea of mud" to a "severe dust bowl" on a weekly basis. Notwithstanding these hardships, flying and maintenance activities continued on schedule. A team of data recorders monitored all activities to determine the actual quantitative RAM/logistical norms and evaluate the adequacy of training courses as well as maintenance publications.

As a result of these efforts and extensive cost and technical studies of the proposed production aircraft, the Secretary of the Army on 23 December 1976 announced that the Sikorsky UH-60A had been selected for production to replace a portion of aging UH-1s

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MID-COURSE CORRECTION

LTC Richard L. Irons

U.S. Army Security Agency
Arlington Hall Station
Arlington, VA

I FREQUENTLY hear grumblings from fellow aviators about some phase or another of the Army in general or aviation in particular about which they are unhappy. At such times I am reminded of the old cliche which goes something like "if they're not bitching, they aren't happy," and I wonder how much truth there is in this saying. The reason I wonder is because I've always believed that people do better in their jobs when they are happier than when there is some form of discontent available to distract them from their duties.

As Army aviators we obviously have no guarantees that we'll always be happy. But, as professionals I think it wise that we periodically evaluate our environment and attempt to identify those items in our surroundings which are sources for unhappiness – or possible job degraders.

Identifying a potential problem is not enough. There are problems which we may not be able to change. Policy decisions quite often fall into this category. An example that comes to mind is the elimination of combat readiness flying for aviators not serving in an operational flying position. Now there's a real thorn in the side. The point is that this is the type of problem (policy decision) which most of us are unable to change. Complain about, yes – change, no!

Well, we've identified a type problem and since we can't change it to lower our dissatisfaction, what can we do to improve the situation that might make us more efficient! The most positive approach is attempting to understand the rationale which went into making the decision with which we are discontent. This calls for a degree of objectivity which is not always readily available. And, I assure you even being objective will not always ensure understanding.

In our previous example, viewing this latest restriction as part of a Government-wide effort to reduce expenditures is the easiest way to explain this decision. Less aviators flying means less aircraft to maintain, less fuel to be consumed, less personnel required, etc. Now this may be true but does it really help ease the pain if you fall into the category affected and really are chomping at the bit to harness up and go flying! Probably not, but on the other hand continuing to complain about a situation you cannot change will not help much either.

There is another category of discontentment to examine and these are job distractors which we can change. Ever hear the complaint, "I just got orders to Timbuktu. Those dumb so-and-so's don't even know that I'm not qualified to do this job!" We've all heard similar complaints. Unfortunately the "dumb so-and-so's" only can assign personnel on the basis of what is in their records. I

am not taking up a crusade to justify what takes place at MILPERCEN (Military Personnel Center) but I have found by looking into similar complaints, that frequently the individuals complaining haven't been to DA to check their records in 4, 5 or 6 years – or in some cases, have never checked their records.

Now, getting a local checkout on a UH-1 Huey is real fine and chalking up a few hundred hours also is nice. But if your records at DA do

not reflect this training, don't expect the "dumb so-and-so's" to take what's not available to them into consideration. And don't expect that just because you have the training, it will automatically get into your records – *or* get into them correctly. I use this example only to point out that there are forms of discontent which can affect job performance for which each individual can change and indeed has a personal responsibility and interest to change. There are many similar potential problems which can be avoided by more personal attention to maintenance of all administrative records.

A third category of complaint is on the personnel side – the one about, "don't schedule me with him, I don't like him, he's stupid." At the risk of sounding like a preacher, I think most personality problems stem from a lack of understanding or knowing a person well enough.

I can vividly recall during my earlier years meeting a gentleman whom I immediately did not like. The individual was a rather gruff looking person but never had done anything to provoke in me the dislike I felt. As time wore on and I became more familiar with this man, I grew to understand and like him.

I expect we've all had similar experiences. I was shocked and embarrassed later to realize the

unjustness of my initial feelings but gained greatly from the experience. I don't suggest that by trying to understand others that we'll end up liking everybody. Heck, there are lots of people that don't like me and probably know me pretty well. My point is that we can minimize personnel problems somewhat by not being too hasty to speak ill of others and by making a concerted effort to understand, and perhaps help, those we initially don't like, or disagree with over some point. Complaining about this kind of problem won't change anything – nor will it make you much happier.

In the wake of the National Bicentennial, I believe it's a good time in Army aviation to take a good look at ourselves. Not so much to complain, but more to see where we are in our careers; where we need to be going; and what we can do to improve ourselves as individuals and Army aviation as a profession. You can only make a mid-course correction after you've determined where you are and where you want to go. I doubt if any of us are truly on-course. So let's take a look!

Army aviation, like the familiar cigarette slogan, has come a long way, professing all along the way to be "Above the Best." While I've never doubted the truth of this motto, I believe we now need a rededication to this principle.

It isn't easy in the present peacetime environment to maintain the esprit and dedication which always has been associated with the Army aviator. It's tough to keep an interest in aviation when you can't fly because there's no money. It's also tough to catch up on aviation policy and equipment changes when you've neglected them. If it means swallowing a little pride and trying to enjoy a synthetic trainer, maybe we'll just have to buckle down in them.

Speaking of synthetic trainers, they've really improved. The UH-1 and CH-47 simulators are now available at the U.S. Army Aviation Center, Ft. Rucker, AL, and are several generations ahead of the old Link trainers. I flew one recently and not only did I learn something but I also kind of enjoyed the experience.

If there's any one thing that exemplifies Army aviators it's their unique ability to innovate. We've capitalized on suggestions from our aviators over the years and the results are evident in the quality of our training, equipment and tactics. While a lot has been done, there's more of a challenge

ahead for the innovative mind. How are we going to do more with less? How do we maintain quality trained aviators when we can't fly as much? How can we improve our equipment, tactics, organizational procedures? These are the type questions we want to look at and develop solutions for.

Remember getting shot at with no armor protection and feeling somewhat naked? We've got armor now – but it's heavy and maybe we need more. We are getting more and better aircraft survivability equipment (ASE) everyday, but we need to examine the capabilities of this ASE; develop methods to test it under expected deployment postures; develop sound procedures for employing this equipment; and institute additional training programs to ensure that all aviators learn to use and maintain proficiency in the use of the ASE.

Recall the O-1 Birddog, U-1 Otter, CH-34 Choctaw and other older aircraft? They were with us a long time and have been replaced with newer, more sophisticated aircraft. But these newer aircraft are going to be with us a long time too if you perceive the present budget trends as I do. What does this mean? Certainly, we can point to the UH-60A Utility Tactical Transport Aircraft System (UTTAS) and the AH-64 Advanced Attack Helicopter (AAH). But they take lots of money to bring aboard and it could be many years before we see today's fleet replaced. So, we'd be more than prudent by taking care of what we have to our best ability.

Sure, we'd probably get newer birds faster if the balloon went up – but that takes time as well as money and we might well find ourselves flying our present aircraft under less than desirable conditions again. We need to continue the outstanding maintenance we've enjoyed and in fact search for ways to improve our procedures to ensure that we can get the maximum out of what we've got.

While we're talking about maintenance let's again congratulate and thank our maintenance personnel for the truly outstanding job they have been giving us for years. But, let's not stop with thanks. Recognize that with less aircraft flying, there is going to be less aircraft available for training maintenance personnel. We can ignore this fact now and pay the price later. Or, we can acknowledge this potential problem and develop methods for ensuring that these personnel continue to gather the experience needed.

You know, these maintenance people are similar to the grounded aviator. Both have received training in an area for which a degree of proficiency is necessary but, through no fault of their own, they are in fact denied the means to maintain the proficiency desired.

Can we develop procedures to solve this problem? Will rotating personnel more frequently in and out of these jobs help? Can training centers be established solely to maintain proficiency? Would they be economcial? I think there are solutions, but we need to search – think – innovate!

How about our tactics in general? Vietnam sure gave us a lot of experience which has been invaluable, both for that type of warfare in particular and other types as well. But do we have procedures developed to ensure that Army aviation can continue in all types of warfare? Are there any loops? What are they? How do we develop necessary procedures? What about a nuclear environment? You can dismiss this as an unlikely occurrence – I agree, but assuming away a potential problem will never equal accepting the problem as a potential (but unlikely) occurrence and developing procedures to operate. What are our planned procedures to operate Army aircraft in such an environment? Is any special equipment required? Any special training required? Perhaps we can take another look into this area and improve our readiness. If we can only uncover one area for which we have a training gap, then we will have accomplished a great deal. Got any ideas?

This has been a rather philosophical look at Army aviation in general. Certainly all areas were not covered but that's the challenge I want to leave with you. You know, each of us can be miserable in our job if we really try. Complaining doesn't contribute a great deal toward improving a situation. On the other hand if you really want to become happier in your job and to contribute something, quit complaining, take a good look at what your problems are and see if you can't take some positive action to correct the situations. Who knows, you might discover a good reason exists for your discontent. But let's not limit our mid-course corrections to ourselves. We owe our profession something and each of us can contribute something to Army aviation besides a body behind a machine.

Let's begin the Nation's next century with the same enthusiasm and determination that has made Army aviation the profession that it is – so that during the Tricentennial, Army aviators can speak as well of our efforts as we do of our predecessors' endeavors.

VFR

Continued from page 1

would be welcome. Further information may be obtained from:

The Shock and Vibration Information Center
Code 8404, Naval Research Laboratory
Washington, DC 20375
Telephone 202-767-2220 (AUTOVON 297-2220)

Henry C. Pusey
Naval Research Laboratory
Washington, DC 20375

Sir:

O.K. ... all right ... I admit it. I'm one of those overweight people who are in the Army on active duty. Mea culpa. I had an occasion recently to see an article you published on diet for aviators. Would it be possible to get a reprint sent to me? I really enjoy your magazine – get hold of a copy whenever I can. Keep up the good work.

SFC Stephen L. Brown
U.S. INSCOM Spt Grp
Ft. Meade, MD

• A copy of the article "Winning The War On Weight" by Dr. Dennis R. Brightwell appeared in the October issue. A copy has been sent to you.

Sir:

Your belittlement of women shows up in three places in the February issue of the *DIGEST*.

On page 8, your photograph of a sunbather (woman) does catch the reader's attention, but it is not referred to in the article on the same page. If you want your reader to look at the article, catch his attention with the title or with a picture that is referred to in the text. "... an unsightly scar that can't be covered by a bikini" is not a good reference to a scarless woman in a bikini; if her scar is covered by her bathing suit, telling the reader to attend to a covered detail (no pun intended) is useless.

On page 46, you show a picture of a lovely woman across from your article on Personal Equipment and Rescue/Survival Lowdown (Pearl). May the reader assume that the picture is of a woman named Pearl and that the acronym coincidentally almost matches the spelling of her name? Why is there only a line drawing of Richard G. Harding on page 25 and a cartoon of COL Trevor D. Turner on page 10? I accuse you of sexism.

Finally, you have belittled women inside the back cover. I have never heard of any "old wives' tales" about flying at night.

Please equalize your photographs and insults: either unclothe your men in photographs or joke about the ridiculous logic of old husbands.

Della A. Whittaker
Adelphi, MD

Sir:

Reference Major David Price's article "The Army Aviation Story, Part XI: The Mid-1960s" in the July 1976 issue of the *AVIATION DIGEST*.

On page 9 under the subheading The Nature of Airmobility, Major Price gives the impression that the Field Artillery aviation in World War II was in squadrons at corps level. This is incorrect. The aviation was organic to gun and howitzer battalions of divisional and nondivisional artillery. Quite frequently divisions and artillery groups centralized their planes and performed missions for their battalions. Rarely during World War II did Field Artillery batteries exercise fire direction and fire control as these functions were best handled at the battalion or higher levels of command.

COL (Ret) Delbert L. Bristol
Florissant, MO 63033

Sir:

TM 38-250, "Preparation of Hazardous Materials for Military Air Shipment" dated 22 March 1976, provides instruction for preparing hazardous materials for air shipment, labeling requirements, instructions for transporting passengers with hazardous materials and instructions for notifying the pilot in command of hazardous materials on the aircraft. As the manual states, this regulation is to be used by all DOD agencies who ship hazardous materials by military aircraft.

As an Army aviator with 10 years experience in cargo and utility helicopters, I don't recall ever receiving any instruction relative to compliance with TM 38-250. It seems that very few Army aviators are acquainted with it as no mention is made of it during flight training and it is totally ignored in operational flying units.

Is there currently any policy which says that the Army is exempted from compliance with TM 38-250 and if not, what guidance is available to Army aviators who are required to carry hazardous materials on (or under) their aircraft?

CPT Edward M. Strazzini
Fort Eustis, VA 23604

• The *DIGEST* received the following information concerning Captain Strazzini's letter from the U.S. Army Aviation Systems Command, St. Louis, MO.

TM 38-250 is to be used by all Federal Agencies and contractors who ship hazardous materials by military aircraft. The Army is not exempted from this compliance.

The maintenance manuals concerning external transport procedures (e.g., TM 55-450-8, TM 55-450-11 and TM 55-450-12) reference TM 38-250.

TM 38-250 is not referenced when describing internal transport of hazardous material. The aircraft maintenance manuals (dash 10s) and the USAAAVS Aviation Resources Management for Aircraft Mishap Prevention Guide are being changed to include TM 38-250 as a reference manual. The Aviation School (Ft. Rucker, AL) also is being contacted to include TM 38-250 as part of the training program.

OOPS! In the March 1977 issue of the *DIGEST*, the byline for the article "Minutemen Of Today" read Lieutenant Colonel Douglas L. Gill, State Aviation Officer. The byline should have read "State Aviation *Advisor*." The *DIGEST* regrets any inconveniences this error may have caused.

BIG WINDY

CW2 Emilien O. Loiselle
180th Aviation Company (ASH)
APO New York 09025

NOE IN A WHAT? That's the usual comment we get here when we tell them we're doing nap-of-the-earth (NOE) in a CH-47 Chinook, fondly called Big Windy in this area. Of course I have to admit my initial reaction was quite similar until I followed it up with a "Why not!" Then the next thing we hear is "Oh, you must mean low level!" or "contour flying!" "You can't get that monster NOE."

Naturally we follow it up with something like "Want to bet a beer on it?"

Let's stop for a moment and analyze the need for NOE in a Chinook. First, being stationed in Europe (USAREUR) sort of helps to put you a little closer to reality. The UH-1 Huey, AH-1 HueyCobra and light observation helicopter (LOH) jocks have adopted NOE as a way of life and are supported by the CH-47s. We probably won't be NOE every time we have a sortie to haul, but we cannot afford to be able to do less than what will be most difficult. We have found that by performing NOE correctly, fewer close calls developed than while low level or contour flying. Pilots also were forced to know more about the aircraft, capabilities and limitations.

O.K., let's get to the start. First my cohort (if you're in the Hook business I'm sure you've heard of "Circuit Breaker Ortelli") and I were sent to a Huey unit – that's one of those helicopters with the aft head on 90 degrees out of phase – for NOE training. We were taught the business and told "good luck." They didn't believe us either. We knew right off we had several problems to overcome. Training a pilot to perform NOE is one thing. But telling an SP6 flight engineer – who has been in the business for awhile – to work the cargo hole through which an external load is controlled while you hover around or fly from 0 to 50 knots, and to keep you informed anytime the load is 10 feet or less from the ground or obstacles, is the closest thing to a brawl since I've been in the business.

So the two of us set out to train an enlisted crew and adapt ourselves to NOE in a Chinook.

Now a Chinook has advantages and disadvantages in the NOE business. The immediate disadvantage is that the two pilots cannot possibly see enough of the aircraft/rotor systems to do a whole heck of a lot of clearing by themselves. So we set out a few ground rules right off.

- A minimum enlisted crew of three if you do not have a sling load, and four if you do. A crewmember in each forward cargo window and one on the ramp secured with a safety harness adjusted to restrain from going over the edge of the ramp. The person on the ramp observes the aft rotor. In the case where the fourth crewmember is used to work the cargo hole, that person also must be secured with a safety harness.
- The crew notifies the pilot any time the rotors or load is within 10 feet of something.

Crew coordination and knowledge of what to do in an emergency when this close to the ground is mandatory. Now you other jocks probably are saying, "Hell, it's always been mandatory!" You're right, but think of having six people on the intercom system. In case of a crash the ramp and load people are probably not in a very good position to get seated and strapped in. The "load" is continuously calling the load clearance for you and your mind is working three dimensional plus. Things can get awfully busy in a hurry!

- Each of the crewmembers has a predetermined seat and preadjusted seatbelt, in case their jobs call for them to be out of their seats, i.e., ramp and load.
- We needed a word that would be the key signal in case of a pending collision with trees, ground, or objects as the case may be. We chose to say *emergency, emergency,* which signals the following actions:

✓ The "load" manually jettisons the load, sits down, locks the seatbelt and gets into a good crash position.

✓ The pilot simultaneously releases the load hy-

draulically – double insurance that the load is away. Naturally this ground rule is used in sure crash emergencies, such as an engine failure NOE.

• Our NOE hover power check is done at 60 feet and we must have a 20 percent reserve torque prior to entering the NOE conditions. We have L-11 engines, therefore 58 percent maximum torque will give us the reserve. We have found that this limits our training load to 6,000 or 7,000 pounds, but gives us a good safety margin.

• Single engine failures while hovering out of ground effect have been covered in the dash 10 for some time, but have never been taught, so we incorporated them into our training.

The rest is pretty much similar to NOE in any other aircraft. Some of the advantages of NOE in a CH-47 are: available power; fuel endurance; multiengine; no antitorque problem; no tail rotor to stick into a bush; and it's a fairly stable machine.

We are plagued with some training problems just as most folks are. Let's imagine you were a farmer here and these "two-headed house trailers" kept coming around and trying to blow the world away, as well as flatten your crops. We do have about an acre to our "credit," but that is a local problem which we have under consideration and soon will be resolved. There are other problems, but we manage to overcome them. I guess the answer is yes, sir! We're flying NOE in the Chinook – and damn well, too!

Enlisted Personnel Management System

EPMS CORNER

SFC W.E. Trotman
U.S. Army Military Personnel Center
Alexandria, VA

PSNCO–Who? I may as well give up. My request for MOS change must've been lost or thrown away or something. I've complained to the chaplain, the IG and my mother-in-law and nobody can find out anything."

Does this sound familiar? Have you ever felt that you would be better off talking to a wall than submitting a request for anything?

Well, guess what? The Army has a personal advisor you can turn to on personnel matters. He — or she — goes under the alias of PSNCO. No, this does not mean president of the Society for Never Cranky Officers; PSNCO stands for personnel staff noncommissioned officer. Almost anywhere you go in the Army you will be represented by one. The PSNCO is a technical extension of the servicing personnel office. The favorite hangout of these NCOs is at the battalion, brigade, group or similar HQs S-1 shop.

The job of PSNCO covers many areas — all related to personnel functions. Some of the duties of a PSNCO include keeping the commander informed on the strength, shortages, overages and status of gains and loses for the organization. He visits subordinate unit clerks, first sergeants, administrative NCOs and commanders to assist in resolving personnel problems.

The most important duties of a PSNCO to the Soldier on the flight line, in the maintenance hangar, or operations section, etc., is processing all personnel matters from subordinate units and controlling visits of individuals to the personnel and finance offices in conjunction with the unit first sergeant.

All requests of a personnel nature, to include reassignments, MOS change, extension or curtailment of foreign service tour and request for service school attendance are usually processed through the PSNCO; so this is the person to know. The PSNCO is the person with the connections and the know-how to ensure that your request gets proper consideration.

So, if you have a personnel-related problem or desire assistance in the personnel area, call or visit your PSNCO. You can stop talking to the walls then too.

Recommended Prerequisite Changes For Initial Entry Into CMF 67. The increasing complexity of new aeronautical equipment being obtained by the Army has prompted some recommendations for change of prerequisites for initial entry into CMF 67.

Generally the changes consist of higher minimum aptitude scores as well as slightly stricter physical profile limitations.

Currently most MOSs in CMF 67 require mechanical maintenance (MM) aptitude score of 90. It has been recommended the MM minimum be increased to 100.

Personnel already in CMF 67 will not be affected by the recommended changes in most cases. Soldiers whose physical profile serial changed to below minimum for entry into their MOS may, in most cases, be retained upon the recommendation of the commander or reclassification board.

Personnel whose aptitude score is below the minimum for initial entry may be retained as long as they demonstrate proficiency in their MOS.

If approved, the changes will appear in AR 611-201 and DA Pamphlet 351-4.

Optimizing Takeoffs

Continued from page 7

performance, the distance required to clear an obstacle in the departure path.

We all know that exceptional care must be taken when operating helicopters from an area bounded by natural or manmade obstacles – especially when operating at or near maximum gross weight. Combinations of high altitudes, temperatures and heavy payloads may degrade performance to the point where hovering flight cannot be maintained out of ground effect. Under these heavily loaded conditions, a running takeoff is required. If obstacles exist in the departure path (figure 1) extreme piloting skill is required.

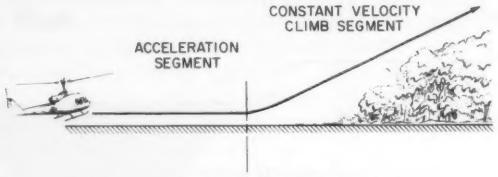


Figure 2. Typical near-optimal takeoff trajectory

Situations similar to the one described above were encountered frequently in the Republic of Vietnam where landing areas often were surrounded by trees and/or high terrain. Also, the helicopter's performance was compromised by the abnormal temperatures and altitudes of that country.

Looking back one might ask, why were some pilots much more adept at performing heavily loaded takeoffs than others? What is the optimal takeoff procedure for a heavily loaded helicopter operating from a confined area? What are some pilots doing that others are not that make a takeoff seem easy?

In response to these questions, research scientists teamed up with pilots of the Air Mobility Lab to determine the optimal takeoff profile for a heavily loaded helicopter. Initially, the takeoff derived from a theoretical standpoint consisted of a maximum acceleration segment parallel to, but off the ground, followed by a decelerating climb segment (zoom) in which altitude was gained while losing airspeed. Unfortunately, this maneuver proved too complex to be operationally useful and it required more than a modest amount of piloting skills. To simplify the problem, the decelerating flight segment was eliminated. This "modified" optimal control problem was reevaluated and formulated into a smooth two-segment takeoff trajectory.

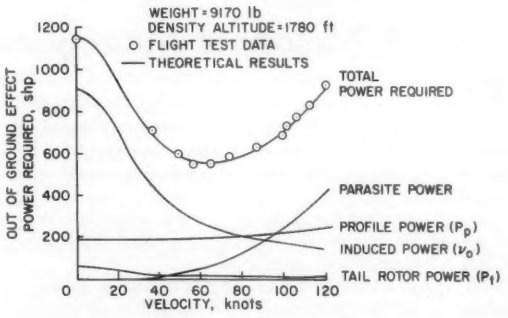
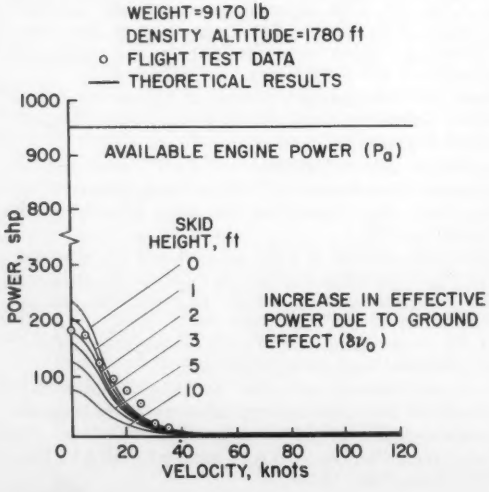


Figure 4. Shaft horsepower required as a function of velocity

Figure 3. Available engine power and effective increase in available power due to ground effect as a function of velocity



The maneuver (figure 2) begins by accelerating parallel to the ground, in ground effect, to a specifie rotation speed. At the specified speed, all excess power is used to rotate and climb over the obstacle. During the climbout segment, airspeed is held *constant* at the rotation speed. Some takeoff performance is sacrificed by constraining the solution, but the maneuver is extremely simple and easy to perform.

The reason some pilots are more adept at making heavily loaded takeoffs is actually due to (perhaps unknowingly) making use of the difference between the total power available (figure 3) and the power

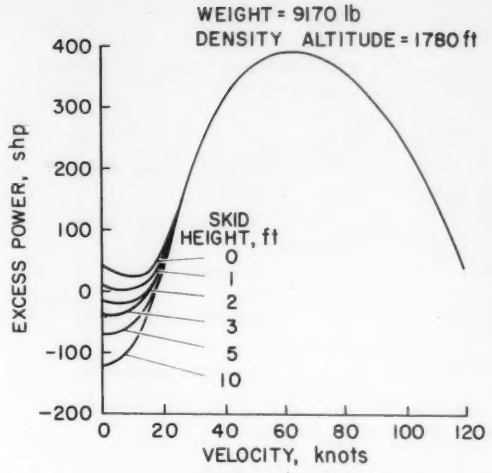


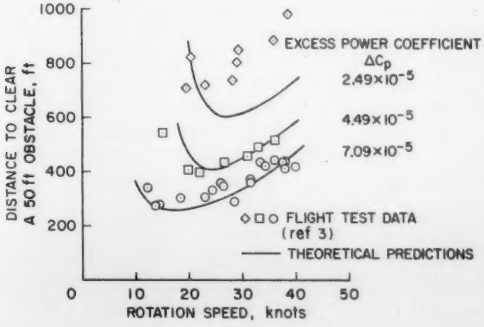
Figure 5. Excess power available as a function of forward speed and skid height

required to perform the maneuver as shown in figure 4. This "excess power" is shown in figure 5 as a function of forward speed and in figure 16 on page 23 as a function of ΔN_1 percent.

The excess power is observed to increase rapidly with forward speed. At very low forward speeds, the excess power available is really a function of the rotor height (shown in figure 5 as variations in skid height) above the ground. Using this information, the pilot's problem in executing a "maximum effort" takeoff is simply to use this excess power in the most effective manner to clear obstacles in the departure path.

Excess power and rotation speed have an important effect on takeoff distance (figure 6). As expected, lowering the excess power dramatically increases takeoff distances. Rotation or climbout airspeed also influences takeoff performance. If rotation and climbout occur at other than the optimal climbout velocity (figure 7), takeoff distance also increases (figure 8). The increase is most dramatic at velocities *less* than the optimal, where the power is still relatively high and the excess power is nearly minimal (figure 5).

Figure 6. Distance to clear a 50-foot obstacle (UH-1C) as a function of excess power and rotation velocity



At this point, only a shallow climb angle can be maintained. At higher rotation speeds the excess power goes up somewhat and much steeper climb angles are possible, but some of the advantage of the higher climb angle is offset by a longer acceleration distance. If the optimal rotation speed is exceeded, the takeoff distance begins to lengthen due to excessive acceleration.

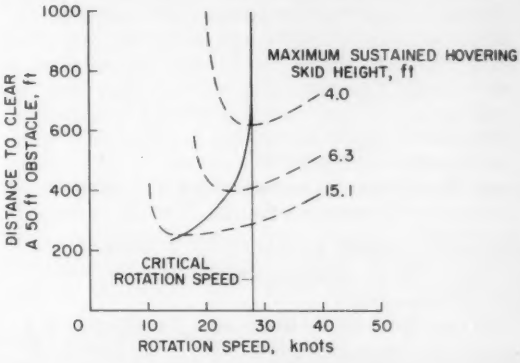


Figure 7. Critical rotation speed for the UH-1C

The effect of skid height on takeoff distance is illustrated in figure 9. The power needed to increase hovering skid height from 2 to 3 feet decreases the benefits of ground effect power by about 30 percent. This decrease in effective power available increases takeoff distance by 300 feet, if the 3-foot skid height is maintained during the acceleration segment. (Actual percentages and distances will vary as conditions vary.)

Of course we already know that wind can cause large variations in takeoff distance, as shown in figure 10. Headwinds significantly reduce takeoff distance while tailwinds do the opposite.

The current technique used by Army aviators to determine if a safe takeoff can be initiated is to measure turbine speed N_1 at a 2-foot hover and consult a go/no-go placard which relates this estimate of power to the helicopter's maximum power capability N_1 max corrected for local ambient temperature. Because the placard for aircraft with T53-L-11 engines has been configured to yield a conservative

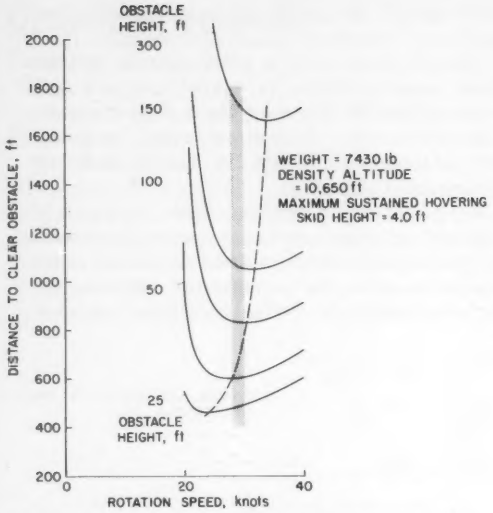
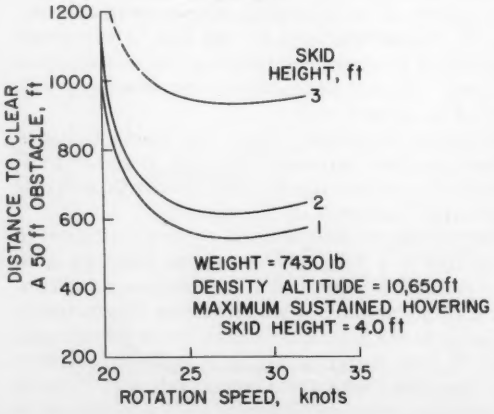


Figure 8. Takeoff distance as a function of obstacle height and rotation speed

estimate of takeoff capability, a 3 percent ΔN_1 (N_1 max - N_1) is required before heavily loaded are to be attempted.

As seen from figure 16 on page 23 and figure 6, 3 percent ΔN_1 represents a relatively large amount of excess power. In an open area, the pilot would have little trouble performing a coordinated takeoff. However, in a confined area, no guarantee of clearing obstacles can be made. In fact, under ideal conditions, takeoff distance to clear an obstacle of fixed height depends upon engine operating condition, density altitude and piloting technique. Near optimal takeoff profiles only minimize takeoff distance

Figure 9. Takeoff distance as a function of skid height during acceleration



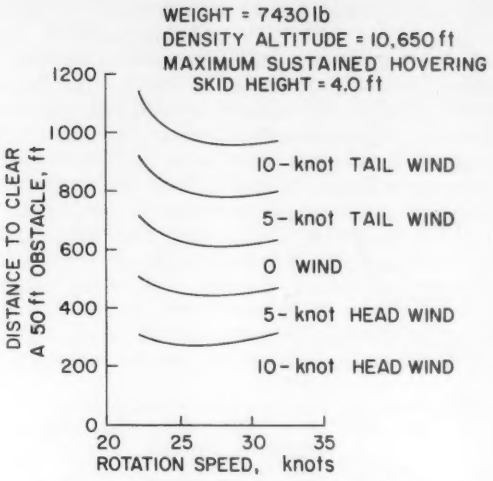


Figure 10. Takeoff distance as a function of wind

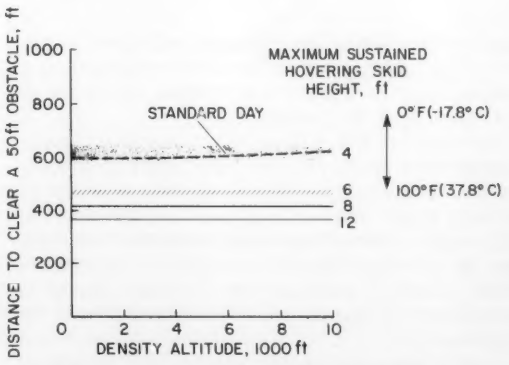


Figure 11. Distance to clear a 50-foot obstacle (UH-1C)

– but estimates of actual takeoff distance are not tied directly to ΔN_1.

In tactical situations, excess powers on the order of 3 percent ΔN_1 are not always possible and heavily loaded takeoffs from a confined area may still be required. Through experience, many pilots have learned to correlate heavily loaded takeoff performance capability with maximum sustained hovering skid height. Because maximum skid height in hover accounts for variations in density altitude, gross weight and excess power, it appears that skid height can be used as a natural "indicator" of takeoff performance.

Figure 11 shows the distances required to clear a 50-foot obstacle as a function of density altitude and temperature for several maximum sustained hovering skid heights using the near-optimal takeoff

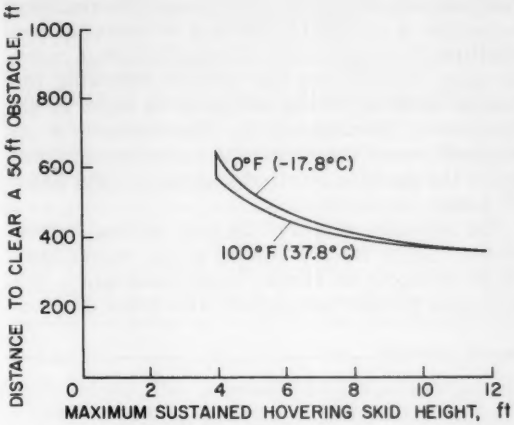


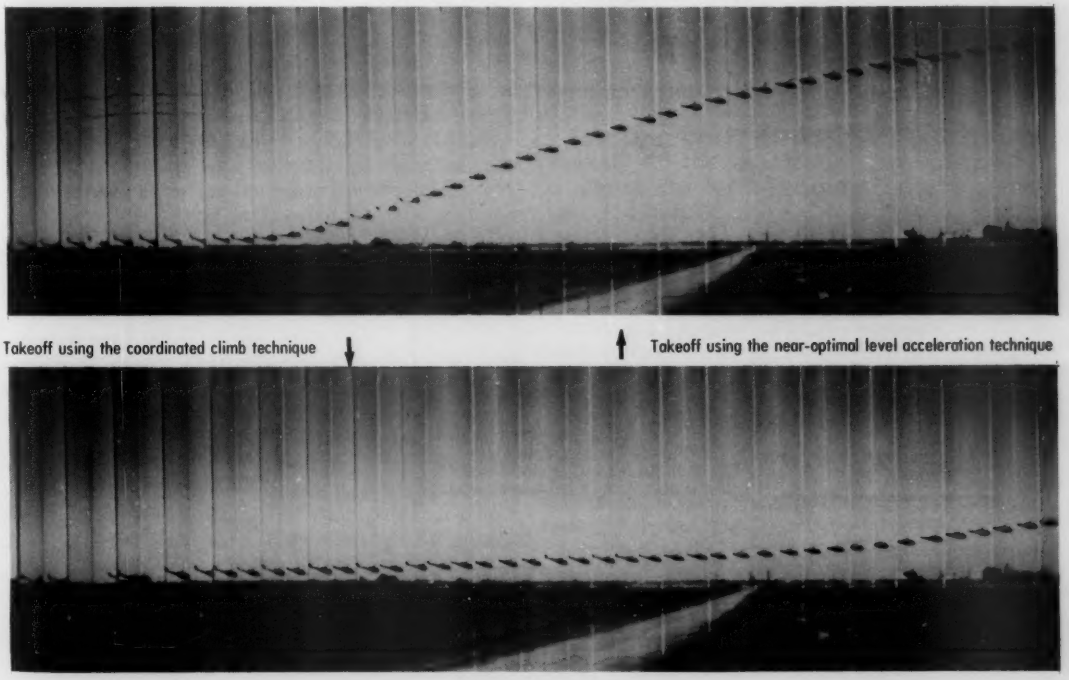
Figure 12. Distance to clear a 50-foot obstacle using near-optimal technique (UH-1C)

technique. The resulting curves, which are functions of ambient temperature, are most sensitive to temperature changes at small hovering skid heights. Measuring the maximum sustained hovering skid height really can be used to estimate takeoff distance rather than solely relating takeoff distance to density altitude and gross weight (which is the present method).

Figure 12 shows how skid height can be used operationally. The maximum and minimum takeoff distances for temperature variations of 0 degrees to 100 degrees F indicated in figure 11 are plotted against hovering skid height to yield a simple banded curve. By determining maximum hovering skid height and then referring to this one plot, a pilot can estimate his near-optimal takeoff distance over a 50-foot obstacle, under no-wind conditions. This information, coupled with the pilot's experience and judgment, can help the pilot decide whether or not takeoff should be attempted.

Comparison With Standard Technique: A simple flight test was performed, this time using a UH-1B to compare the coordinated climb technique with the near optimal. The helicopter was loaded with lead brick so that it could sustain a maximum hovering skid height of only about 5 feet. Pilots were asked to fly a sequence of takeoffs – alternating between the two techniques. A 16-mm movie camera and a Fairchild Motion Analyzer camera were used to record takeoffs. The dramatic difference between the two control policies is graphically shown in figure 13. When the near-optimal

Figure 13. Comparison of near-optimal and coordinated climb techniques



technique was used, the distance required to clear an imaginary 50-foot obstacle was less than one-half that required by the conventional technique.

The coordinated climb technique (figure 14) is usually initiated from a 3-foot steady-state hover. The takeoff begins when the pilot simultaneously applies full power and horizontally accelerates, maintaining a constant 2 to 3-foot height above the ground. At the inception of the "translational lift" (10 to 15 knots for both the UH-1B and the UH-1C) a noseup pitching moment causes the tip-paof the helicopter to rotate, initiating the climb segment. A 40-knot flight attitude is assumed as the vehicle accelerates and climbs out at full power. The resulting maneuver is similar to a normal acceleration and climb profile used for normal takeoffs. In both cases, the pilot coordinates his controls following the natural tendency of the helicopter to climb at the inception of translational lift. This similarity is undoubtedly one of the major reasons for the continued use of the coordinated climb technique under heavily loaded conditions.

The beginning stages of the near-optimal takeoff profile (figure 15) are similar to the coordinated climb technique for heavily loaded helicopters. The helicopter initially is brought to a 2 to 3-foot (approx-

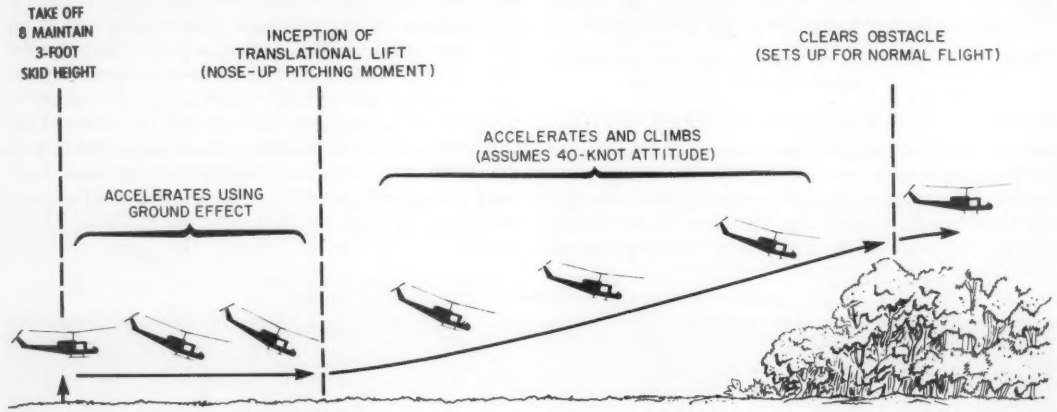
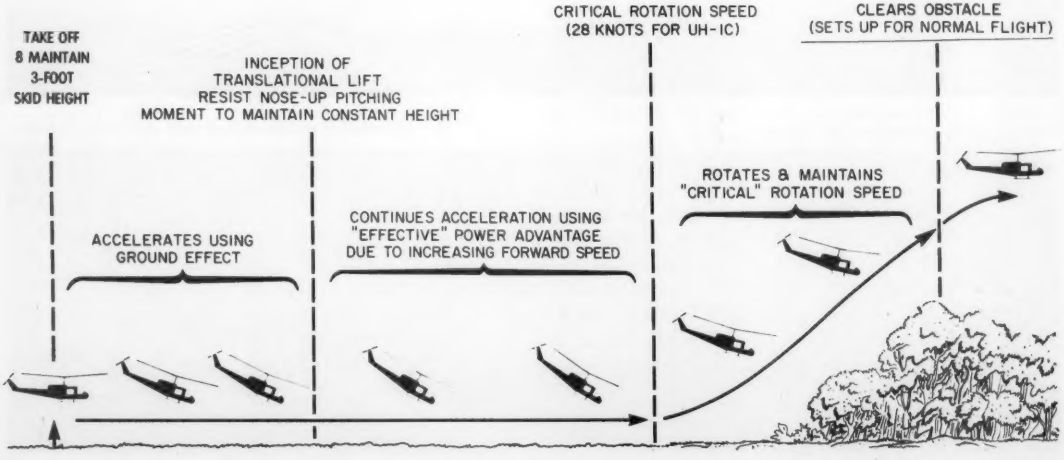

TAKE OFF & MAINTAIN 3-FOOT SKID HEIGHT
INCEPTION OF TRANSLATIONAL LIFT (NOSE-UP PITCHING MOMENT)
CLEARS OBSTACLE (SETS UP FOR NORMAL FLIGHT)
ACCELERATES AND CLIMBS (ASSUMES 40-KNOT ATTITUDE)
ACCELERATES USING GROUND EFFECT

Figure 14. Coordinated climb takeoff technique

Figure 15. Near-optimal takeoff technique


CRITICAL ROTATION SPEED (28 KNOTS FOR UH-IC)
CLEARS OBSTACLE (SETS UP FOR NORMAL FLIGHT)
TAKE OFF & MAINTAIN 3-FOOT SKID HEIGHT
INCEPTION OF TRANSLATIONAL LIFT RESIST NOSE-UP PITCHING MOMENT TO MAINTAIN CONSTANT HEIGHT
ROTATES & MAINTAINS "CRITICAL" ROTATION SPEED
CONTINUES ACCELERATION USING "EFFECTIVE" POWER ADVANTAGE DUE TO INCREASING FORWARD SPEED
ACCELERATES USING GROUND EFFECT

TEST CONDITIONS			EXCESS POWER		
GROSS WEIGHT, lb	DENSITY ALTITUDE, ft	AMBIENT TEMPERATURE, °C	ΔCp	MAXIMUM SUSTAINED HOVERING SKID HEIGHT, ft	ΔN_I, percent
7430	10,650	1.46	2.49×10^{-5}	4.0	1.41
7590	9,525	−5.23	4.40×10^{-5}	6.3	2.56
7230	9,599	−4.16	7.09×10^{-5}	15.1	4.11

Figure 16. Summary of flight test conditions.

imate) hover. The maneuver commences when all available power is utilized to accelerate the helicopter horizontally at a constant 2 to 3-foot height. However, at the inception of translational lift, enough forward cyclic is applied to counteract the noseup pitching moment and maintain the 2 to 3-foot acceleration height. The helicopter continues to accelerate in ground effect at full power to higher forward airspeeds, where additional effective power is available.

At the critical rotation speed (approximately 28 to 30 knots for the UH-1B and C) the helicopter is rotated. Climbout is performed at constant velocity at full power. The distinguishing feature of the near-optimal takeoff profiles is the forward cyclic control at the inception of translational lift. The helicopter is forced to use all available power to accelerate to higher translational velocities before steady-state climb is initiated. Analysis of the resulting maneuver appears quite obvious. Advantage is taken of the large excess power climb angle. To the aviator flying the helicopter, this may not look like the "best" maneuver. The pilot is asked to fly the helicopter toward the obstacle at higher airspeeds and to resist the natural tendency of the helicopter to start the climb at the inception of translational lift.

In most cases, when other pilots not familiar with the near-optimum technique were asked to perform a simulated heavily loaded takeoff, they flew a variation of the coordinated climb technique. However, after some verbal instructions and a little practice, these pilots were able to improve their takeoff performance substantially. After further practice, pilots agreed that the simple near-optimal takeoff profile yielded the best heavily loaded takeoff performance from a restricted area.

The major significance of this research lies in its application to solve conclusively the real problem of operating heavily loaded helicopters in a restricted area. In this sense, there were two major findings: *First*, a simple, near-optimal takeoff control policy has been developed and confirmed for heavily loaded helicopters operating from a restricted area. The maneuver consists of two distinct operational segments – a maximum acceleration segment and a climb segment. Rotation and climb commence at the "critical" rotation speed which is dependent upon the type of helicopter but is independent of operating conditions. Near-optimal takeoff performance is assured if the simple, two-segment maneuver is employed.

Second, a means has been presented for estimating the distance a given helicopter needs to clear a 50-foot obstacle utilizing the near-optimum technique. This estimate is only dependent upon the maximum steady-state hovering height capability of the helicopter.

The Army's new standard performance charts provide all the information necessary to accomplish the level acceleration near-optimal takeoff described above.

REFERENCES

Schmitz, F.H., "Takeoff Optimization for STOL Aircraft and Heavily Loaded Helicopters," TR-ECOM-02412-4, August 1969, U.S. Army Electronics Command, Ft. Monmouth, NJ.

Schmitz, F.H., "Optimal Takeoff Trajectories of a Heavily Loaded Helicopter," *Journal Of Aircraft*, Vol. 8, No. 9, September 1971, pp 717-723.

Melton, J.R. et al., USAASTA Final Report 66-04, Engineering Flight Test of the UH-1B Helicopter Equipped with the Model 540 Rotor System, Phase D, U.S. Army Aviation Test Board (now Test Activity), December 1966.

Lewis, Richard B., "Army Helicopter Performance Trends," American Helicopter Society Paper No. 500, Washington, DC, May 1971.

Vause, C. Rande, F.H. Schmitz, "Near Optimal Takeoff Performance of a Heavily Loaded Helicopter in Ground Effect," Eighth Army Science Conference, West Point, NY, June 1972.

Emergency Eg
ATC

MSG Herber
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Fort Hu

HAVE YOU EVER noticed that usually the tallest building on an airfield is the air traffic control (ATC) tower?

"That's normal," you say, "because the control tower cab should be high enough so that the controllers can have an adequate view of the airfield and surrounding area." Agreed?

Now ask yourself this question: "When there is a fire in the building below the control tower, how do people escape from the tower cab without running through the smoke and the fire?" Jumping from the tower's catwalk to the ground, remaining in the control tower cab, hoping for the "best" and "crying a lot" are not the methods recommended for escape.

A control tower emergency evacuation plan is mandatory for each tower. Its purpose is to provide an orderly and rapid evacuation during an actual emergency. When utilized properly the control tower emergency egress system will help the control tower personnel to escape a hazardous condition in or under the control tower cab.

Army's ATC tower chiefs are required to formulate an evacuation plan for tower personnel should fire occur in the tower cab or in the building below the cab. At one time many Army control towers used knotted ropes as escape systems. These ropes were tied to a secured portion on the outside of the tower cab and left coiled on the tower's catwalk until needed. Some of the ropes would rot from exposure to weather elements causing a definite hazard to safe evacuation.

Now, some facility chiefs procure a flexible ladder from a CH-47 (Chinook) helicopter, fasten it to the tower's catwalk and use it for a fire escape (if the tower is not too tall). Control towers with steel ladders attached to the buildings are not found too

View from Schwaebisch Hall Tower as controller acti
monitors air d

gress Systems
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ber V. Denmark
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Huachuca, AZ

rollers practice emergency egress. The unit training officer
nitors their descent

often at Army airfields.

Another method that can be used for rapid, controlled tower-to-ground descent is the Sky Genie system. (See Federal Supply Schedule, 1 Aug 75, Item No. 59, NSN 4240-00-620-6561 and related equipment.)

Ground control approach (GCA) radar facilities also must have an emergency egress plan. At many Army airfields the GCA facility is not collocated with the control tower; landing-control central, AN/TSQ-71As and/or AN /TSQ-72As, are used at some airfields. Others use trailers or small buildings placed at some location on the airfield. The site selected for these GCA facilities will depend upon the configuration of the airfield. When not installed as part of a landing control system, the radar indicators may be located at the maximum distance permitted by interconnecting cables. In many instances the site is relatively close to the runway. "But what happens," you ask, "when an aircraft is off course and headed toward the GCA facility?" The controllers are inside the facility and can't see where the aircraft is headed.

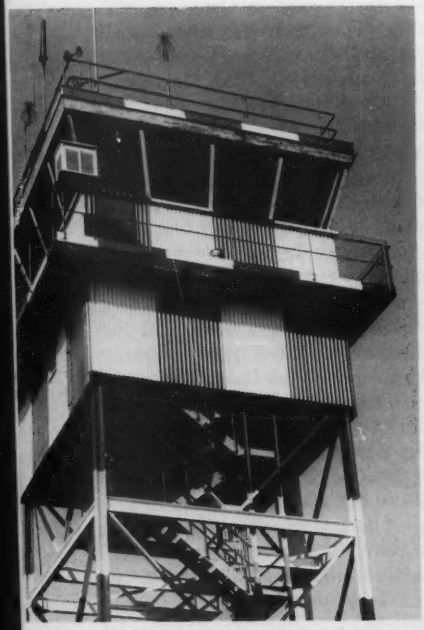
Calm down! The Army is way ahead of you. Army control towers located at airfields where the GCA facility is not located in the same building have emergency alarm systems that will alert the GCA facility when imminent hazards to the GCA facility develop. This system usually consists of an emergency alarm switch in the control tower and an emergency alarm bell in the GCA facility. In the event of an emergency landing, or when for any reason a landing aircraft might present a hazard to ground personnel, the tower controller activates the emergency alarm. The alarm switch is left on until radar personnel acknowledge it or the tower controller observes the radar personnel evacuating the facility. The

Above, SP4 Leslie M. Gleason, air traffic controller at Hood AAF, Ft. Hood, TX, the first WAC controller to test the "Sky Genie." Right, CPT Tobin, the unit training officer at Schwaebisch Hall, instructs controllers in use of the "Genie." Left, SSG Turner, tower chief, practices egress

controller is required to notify GCA personnel of the developing emergency through normal communications channels. Upon hearing the alarm bell, radar personnel should evacuate the facility immediately; except when safety of flight would be jeopardized by the evacuation of all personnel. When the aircraft presenting the hazard is executing a GCA approach, only the minimum number of personnel needed to conduct the approach will remain in the facility.

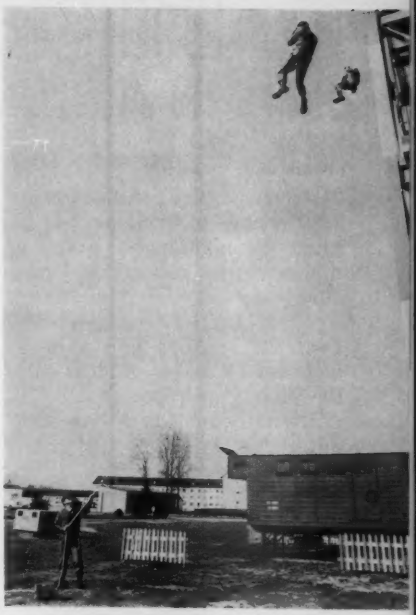
The GCA facility sited near the runway has always been a source of concern. Chester F. Porterfield, in his book, *The Story of GCA*, gives this account of an early GCA situation:

> At Honily, the RAF (Royal Air Force) training field, it had been noticed that for some reason pilots would swerve to the left, toward the GCA, as they came opposite it after touching down. One night, discussing this, the directors of the program decided that an extra 100-foot margin might be a fairly good idea, and the next morning moved their Mark II



training set that much further from the runway. That afternoon a Lancaster bomber got slightly out of control after touching down, swerved to the left, and passed directly over the previous position of the GCA. (Whew!) But one Ninth Air Force crew was not quite so fortunate. Their set was moved up to Frankfurt in the general advance into Germany; they hurriedly lined up for the first night's operation, then went to supper. At that moment a P-51 landed, blew out the left tire and ground looped directly at the GCA. Its left wing hit the trailer, pushing the azimuth antenna up against the indicator rack; the engine accounted for the elevation antenna and the transmitter rack; and the rest of the plane wrapped itself around the back of the trail trailer, leaving the entire GCA surrounded by P-51! Fortunately, the pilot was not injured, but both plane and GCA were total wrecks.

Some of today's Army GCA facilities are located near runways. The emergency alarm system is extremely important to these facilities. The safe, orderly and expeditious flow of personnel from an unsafe tower cab or GCA facility is essential to the physiological and psychological wellbeing of ATC personnel. All personnel assigned to a facility should be familiar with the emergency egress plan and participate in periodic drills. An emergency egress system is mandatory – not an option!



Above, CPT Tobin steadies lines for descents being made by SSG Turner and SP4 Meddhoff. Left, the unit training officer explains use of the "Sky Genie" to SSG Standeven, WAC controller and at right she meets the challenge

HELICOPTERS IN AERIAL COMBAT

Continued from page 9

22,000 pounds and can carry about 2,800 pounds of armament to include a considerable array of machineguns, rockets and missiles (see "Behind The Hind," April 1977 *DIGEST*). It has optical contrast sensors and a nose-mounted TV seeker. Additionally, the Soviets are reported to be operationally testing a true fire-and-forget missile with an extended range for the Hind.

What does this mean to Army aviators who may be part of a combined arms team on a high threat battlefield? Can we assume that threat forces will use attack helicopters in much the same manner we will – as tank killers? Can we assume that Army aviators will not be engaged by enemy attack helicopters? There probably will be disagreement even among the most informed on either question. However, it is only logical to assume that the dynamic modern battlefield will not conform to predictable and logical plans of action. Therefore, it does not make good sense to rule out the possibility, or even the probability, that opposing attack helicopters will meet on the battlefield.

There are two important and interrelated reasons beyond battlefield dynamics to assume that the twain shall meet. The enemy will place priority on antihelicopter combat in direct proportion to the amount of damage inflicted by our helicopters. We know the potential enemy relies heavily on armored forces, and we expect our helicopters to be successful tank killers. It follows that the opponents are not going to stand by and watch their tanks be systematically destroyed by our attack helicopters. Given the foregoing, we can expect the enemy to place a high priority on killing our attack helicopters.

As stated earlier, we have resolved to contend with the enemy's considerable air defenses. What, then, is going to be used to destroy our helicopters? Throughout history, like system countermeasures have proven to be the best; i.e., tank versus tank, fighter versus fighter, artillery versus artillery, et al. In the application of that principle, the helicopter is no exception. The best weapon to defeat a helicopter is another helicopter. The only advantage one like system has over another is technological, either in overall system design or in armament. The advantages here do not have to be large. Sometimes, a comparatively small technological advantage in like systems can be decisive.

Our Infantry knows what it is faced with on the next battlefield. Those involved with Armor, Artillery or fighter planes are thoroughly familiar with the capabilities of their potential counterparts. What do Army aviators know about enemy helicopters? Are they aware of what the enemy helicopter's basic capabilities are, including its tactics? Do they know how to defeat an enemy helicopter or whether they can even defeat it if they try? Indeed, can Army aviators be sure they can even survive an engagement by an enemy attack helicopter? In any event, no Army aviator can be expected to ignore the threat.

It may be argued that the mission of defense against enemy aircraft belongs to air defense artillery and the U. S. Air Force. However, it can be argued just as eloquently that every Soldier has the fundamental right to self-defense anywhere on the battlefield against any threat. A case in point is that it is the Infantry's mission to close with and destroy the enemy. But Infantry does not argue with the supply or medical specialist's right to a basic Infantry weapon for self-defense. Why! Because there is no way the Infantry can guarantee to that supply or medical specialist that it will always be around when a threat presents itself.

Yes, the helicopter is here to stay. But, like the song suggests – let's look at it from both sides now. Technological capabilities are such that helicopters can be fitted with air-to-air missiles. Why not do it? Army aviators should not be the only exception to the right of self-defense. This is by no means to advocate that the attack helicopter's role should be changed. It is but to emphasize that, unless Army aviators are equipped to defend themselves against the best attack helicopter the enemy has to offer, they may find themselves unable to accomplish the Army's mission for which its helicopters are designed.

We are committed to winning the first battle of the next war, because it may very well be the last battle. This is all the more reason not to adopt a posture of wait and see or, more correctly, wait and hope. There will not be time to improvise in the next war. Will Army aviators be the Captain Hawkers or will they be the surprised and repentant victims? The U. S. can ill afford to learn that lesson the hard way.

The author wishes to thank Major Jesse Glance, now with the Armament Test Division, U.S. Army Aviation Board, for research provided and used in this article

UTTAS HELICOPTER

Continued from page 11

and fulfill the new UTTAS mission. Hence the UTTAS will be the backbone of Army mobility through the year 2000.

The UH-60A will transport a full squad of 11 combat-equipped troops at cruise speeds up to 147 knots in an Army hot day environment of 4,000 feet pressure altitude and 95 degrees Fahrenheit (F), for 300 nautical miles. At lower altitudes and temperatures the UH-60A can lift an external load of up to 8,000 pounds. Past efforts to reduce helicopter detectability and vulnerability were limited to such quickie measures as incorporation of heavy armor plate, duplicate critical systems or active jamming systems. Since the UH-60A is a "clean sheet" design rather than a variation of an existing design, such measures which reduce maintainability and mission productivity were avoided. System survival in a hostile environment is an inherent part of the design. For example, critical components using advanced materials and parallel load paths have demonstrated a "get home" capability after direct hits with 23 mm high explosive incendiary (HEI). A 75 percent reduction in detectability is realized by the ability to fly nap-of-the-earth including tight 3.5g maneuvers. Additionally, the rotor system incorporates a unique swept-tip blade, eliminating the classical blade slap or popping sound which announced the presence of the current UH-1 helicopter.

If an inflight emergency situation should occur, the crew and passengers have an unprecedented level of added protection by a 95 percent improvement in single engine capability due to the UH-60A's high rotor efficiency as well as power available. Crash survival is enhanced by primary structural integrity at impact speeds of up to 35 feet per second and rollover; maximum crew and troop protection is obtained through the energy attenuation capability of the landing gear and structure under crash loads; and crashworthy seats for all occupants.

Retaining about the same silhouette as current utility helicopters, the UH-60A has a 40 percent superiority in speed and range, while transporting up to five times the single ship payload. Component life expectancy in an undamaged condition is 400 percent longer than current utility helicopters.

Past experience reveals that the propulsion system was a primary cause in reduced helicopter mission effectiveness. Accordingly, an unusually intensive development and test program has been pursued on the General Electric T700 engine for the UTTAS installation. The engine program generally has been scheduled to lead the airframe effort by more than a year to ensure that these classical problems are not repeated.

As of this date the engine has been subjected to more than 10,000 hours of cell testing, 5,000 hours of operation in ground test or tiedown aircraft and 5,000 hours of inflight testing. In addition to ensuring that the design is more rugged than currently fielded engines, primary attention has been directed to minimizing performance losses normally experienced in adverse environments; among these is the first air particle separator to be an integral part of the basic engine. This feature removes airborne foreign particles (e.g., sand or ramp debris) which cause internal erosion and power loss.

The totally modular design of the aircraft allows lower echelon maintenance to replace defective engine units with a standard toolkit, rather than evacuating the entire engine to fixed repair facilities. An advanced power management system will control precisely the 1,543 shaft horsepower available from each of the UH-60A's two engines to reduce pilot workload and ensure sufficient power at high density altitudes (i.e., 4,000 feet/95 degrees F) where current helicopters must sacrifice more than 50 percent of their normal productivity.

During 1977 primary program attention will be focused on intiating production of the UH-60A, correction of minor deficiencies identified in the previous testing and completion of subsystem qualification tests. In 1978 the modified prototype will undergo a series of environmental tests. These include tropic tests at Ft. Clayton in the Panama Canal Zone; the Northern Continental United States test at Ft. Drum, NY; the desert tests at Yuma, AZ; the cold region tests at Ft. Greely, AK; and further engineering tests at Edwards AFB, CA. Validation testing of the first production helicopters and subsequent use by field units of the UH-60A helicopter are programed for early 1979.

Current plans call for production of 1,107 of the UH-60A helicopters for the Army. This may appear to be an inadequate number until you recall the significant increase in productivity of a single UH-60A as compared to several UH-1 aircraft. Thus, the inherently lower maintenance and operating cost of the UH-60A will be further magnified by the reduced inventory of aircraft required, notwithstanding its expanded mission.

U. S. Army airmobility of the 1980s will thus enter a significantly new era in terms of mission effectiveness and efficiency with the most advanced and thoroughly tested helicopter in its history – the UH-60A UTTAS.

OPMS CORNER

Officer Personnel Management System

Aviation Specialty For Senior Officers

LTC B.H. Freeman
Chief, Aviation Management Branch
Professional Development Division
Officer Personnel Management Directorate

THE BASIC PHILOSOPHY of the Aviation specialty (specialty code (SC) 15) was discussed in an article which appeared in the October 1976 issue of the *AVIATION DIGEST*. Brigadier General Benjamin E. Doty, director of Officer Personnel Management, commented on Aviation as an OPMS specialty in the February 1977 issue. In the March 1977 issue Major Tom Walker addressed flight training and Major Dick James followed with an article on company grade and field grade assignment opportunities. This month we address command and assignments at the lieutenant colonel level and beyond.

In discussing senior field grade opportunities, I will do so in two time frames – today and in the future. As addressed in earlier OPMS articles the Army is confronted with the situation where it has more aviators than can be effectively used. Consequently, a sizable number of captains were not designated with Aviation as one of their two OPMS specialties. By tailoring the number of captains placed into the specialty, OPMD can ensure that each has an opportunity of having recurring aviation assignments during the field grade years. Although no commissioned aviator can be guaranteed of making the Aviation Career Incentive Act (ACIA) pay gates and thus remaining qualified for continuous incentive pay beyond the twelfth year of aviation service, those captains selected for the Aviation specialty will have an increased opportunity of meeting the gates since, through the grade of lieutenant colonel, they will receive intensive management in positions requiring qualified commissioned aviators.

Field Grade Utilization: Initial redesignation of field grade officers was based on their experience and potential in all specialties under consideration and the officer's preference for Aviation specialty designation. Considering that most field grade officers were past mid-career, the number of majors and lieutenant colonels designated into the Aviation specialty was not limited by known Army requirements. By not limiting the current field grade officers placed into the specialty, we are unable to ensure that each has the opportunity of having recurring aviation assignments. These officers are either being utilized in their alternate specialty or, because of Army requirements, in duties which are outside their primary and alternate specialty.

Ideally, if only 1,000 majors were designated into the Aviation specialty, they would spend about 60 percent of their time in aviation as majors; as lieutenant colonels, 40 percent; and as colonels, 25 percent. Utilization at the colonel level is not high, but it is not an unusual situation since similar conditions exist in all the combat arms specialties. If quantitative constraints were not placed on the number of captains in specialty 15 today, the Army would continue – as the group progresses – to have more field grade aviators than could effectively be utilized. Many of today's majors and lieutenant colonels, even if they were to fly continuously until their 18th year of aviation service, could not accumulate a minimum of 9 years in operational flying assignments to meet ACIA requirements. Fortunately, under OPMS, an officer who does not pass the gates will still remain qualified for the Aviation specialty and eligible for aviation assignments.

Officer Personnel Management Directorate (OPMD) did not redesignate specialties for colonels. The Aviation specialty will appear at the 06 (colonel) level as lieutenant colonels reach promotable status. Assignment to specialty 15 positions at the colonel level, at present, are made based on an individual's qualification rather than on a specialty designation.

Future Utilization: What I have discussed thus far relates only to the current aviator force. The situation will be different in the future and utilization will be more in line with the ideal specialty requirements. With a reduced level of aviator procurement, virtually all officers now being accepted into flight training will have Aviation as a specialty, and because of aviation requirements they will have a high degree of probability of meeting the 12-year gate requirement. However, it is possible for an officer selected for the Aviation specialty to fail the 12-year gate and pass the 18-year gate. Again, passing the ACIA gates is not tantamount to remaining in the specialty.

Another point which should be made is that the specialty designations have not changed the Army's overall flying utilization rates for the current field grade officer population. For the future it will allow OPMD to concentrate specialty development efforts on a selected number of aviators. It must be realized that the Aviation specialty is not a panacea for all ills. The specialty, in itself, does not ensure that aviators will get promoted – job performance and potential remain at the heart of the promotion system. However, the establishment of an Aviation career specialty does act as an incentive for quality officers to continue to pursue a career in aviation. Similarly, the opportunity for aviators to command has not been changed. Having Aviation as a specialty will allow field grade officers of the future to concentrate their development in two areas. This allows the officers an opportunity to enhance their expertise and improve their performance, thereby increasing their potential value to the Army.

Command Selection: Aviation commanders for 05/06 commands are selected by a Department of the Army (DA) board. To date the command selected lieutenant colonels have all served in a number of aviation related assignments. Each has flown one or more tours in Vietnam; each has commanded at least one aviation company; and some, as majors, commanded a second aviation unit. Many also have served as company commanders in other than aviation units.

The Lieutenant Colonel Combat Arms Command Board selects aviators who are fully qualified to command the Army's 44 aviation battalions. The Board is composed of one general officer and other officers in the grade of colonel who normally have commanded at the 06 level. Included are one or more rated officers. Command selection boards are guided by separate letters of instruction (LOIs) issued by the Chief of Staff. The LOI stipulates the number of officers to be selected and rank ordered in each command category. When appropriate the LOIs will include additional directions governing selections. For example, while the LOI to the Combat Arms Board indicates that the list of officers selected and rank ordered for aviation commands must include a certain number having air cavalry and air traffic control (ATC) experience, there is no requirement that the selectees for these positions be from a particular branch.

Boards consider the command categories separately and rank order those officers considered fully qualified for command based on qualifications and demonstrated performance. Based on the final rank ordered listings in each command category, Lieutenant Colonels Division, OPMD, will slate as principal command designees a number of officers equal to the number of projected command vacancies.

The objective of the slating process is to ensure the right officer is designated to command the right battalion. The remainder of qualified officers on the rank order listing are alternate command designees to be assigned to fill unprogramed vacancies during the command cycle for which selected. Upon Army Chief of Staff approval of board results, the names of all principal command designees are announced by Military Personnel Center (MILPERCEN) letter. Included with the letter is a copy of the LOI to the board. The names of alternate command designees are not released.

There are seven colonel level OPMS commands that require aviators. Commanders are selected by the Colonel Combat Arms Selection Board. All 06 aviators are considered without regard to specialty designation. The seven commands are:

12th Aviation Group, Ft. Bragg, NC

101st Aviation Group, Ft. Campbell, KY

11th Aviation Group, U.S. Army Europe (USAREUR)

17th Aviation Group, 8th U.S. Army (EUSA)

6th Air Cav Combat Bde, Ft. Hood, TX (Peacetime)

CDR, Davison U.S. Army Airfield, Ft. Belvoir, VA

CDR, U.S. Army Aviation School Bde, Ft. Rucker, AL

The DA Centralized Command Selection System applies only to specifically designated positions and does not embrace all command positions. At the 06 level there are other aviation command opportunities such as commander of the U.S. Army Air Traffic Control Activity at Ft. Huachuca, AZ, and the U.S. Army Agency for Aviation Safety at Ft. Rucker.

Today's aviation commander often is challenged more than commanders in the past by a myriad of nonaviation matters and demands which compete for the attention and all too limited time of the commander. The centralized command selection system, carefully orchestrated, will provide fully qualified officers to meet all the challenges of command.

Lieutenant Colonel Professional Development And Assignment Opportunity: All lieutenant colonels in aviation should continue to advance toward attainment of the professional development objectives established for their two specialties in DA Pamphlet 600-3 and to demonstrate their potential for assuming positions of increasing responsibility. Assignments continue to be made to progressively more responsible and challenging positions, commensurate with demonstrated performance, ability

and potential. These positions require the application of managerial expertise, leadership abilities and overall understanding of military operations.

Some officers designated in the Aviation specialty will be selected to attend a senior service college such as the Army War College or the Industrial College of the Armed Forces. In addition officers may make application to compete for selection to participate in the extremely challenging Army War College Corresponding Studies program. The purpose of these programs (resident and nonresident) is to prepare officers for duty at the highest level. An opportunity may exist for some of these officers who attend the resident course to complete an advance degree under the cooperative degree program in a discipline relating to their specialties. Specialty education for the lieutenant colonel should stress the development of managerial skills and techniques.

Lieutenant colonel assignments in the Aviation specialty range from command of aviation units and activities to all principal staff functions (personnel, intelligence, operations and logistics). Also included are aviation staff officer positions at division level or above. All nine Army Readiness Regions have requirements for 05 aviation advisors. There also are worldwide requirements in Army Military Assistance Advisory Groups (MAAGs) and missions. Aviator lieutenant colonels also serve in a variety of positions to include instructors, project officers and staff officers throughout the Training and Doctrine Command (TRADOC) school system. Every major command headquarters and the DA and Joint Staff have key Aviation positions.

The 40 odd aviation battalions are located around the world with a variety of missions. Generally they are divided into six categories which include: 12 division; 12 combat or assault; 6 attack; 8 air cav; 1 assault support; 3 ATC; and 3 student battalions. Not included are nine maintenance battalions which have aviation logistic responsibilities and are commanded by aviators in the Aviation Materiel Management specialty.

Lieutenant colonel requirements in the Aviation specialty, including the battalion commands, are distributed worldwide by major commands as:

- Joint – 10 percent
- U.S. Army, Europe – 5 percent
- U.S. Army Communications Command – 11 percent
- U.S. Army Forces Command – 31 percent
- U.S. Army Training and Doctrine Command – 19 percent
- U.S. Army Materiel Development and Readiness Command (DARCOM) – 16 percent

The other 8 percent of the lieutenant colonel requirements are divided between U.S. Army Japan (USARJ), 8th U.S. Army (EUSA), Intelligence and Security Command (INSCOM) and U.S. Army Military District of Washington (MDW).

This discussion of lieutenant colonel assignment opportunities has been broad because the variety of assignments available to members of the Aviation specialty are as varied as any specialty within OPMS. Currently there are about 200 lieutenant colonel operational flying positions in the force structure. To meet this requirement there are about 950 lieutenant colonels currently on flying status. Upon implementation of Change 3 to AR 611-101 in the fall of this year, nonflying aviation positions for 85 lieutenant colonels may be shifted from other specialties to specialty 15.

Figure 1

General Officer Operational Flying Positions

UNIT	DUTY POSITIONS	AUTH GRADE	UNIT	DUTY POSITIONS	AUTH GRADE
HDQA, ODCSOPS	Deputy Director of Operations and Army Aviation Officer	BG	Aviation Systems Command	Director, Procurement and Production	BG
			Utility Tactical Transport Aircraft System Source Selection Evaluation Board	Chairman	BG
MAAG, Iran	Chief, Army Section	BG			
6th Cavalry Brigade (Air Combat)	Commander	BG (Wartime)			
Office of the Project Manager, Advanced Attack Helicopter	Project Manager	MG	Advanced Attack Helicopter Chairman Source Selection Evaluation Board	Chairman	BG
Aviation Systems Command	Commander	MG			
Aviation Systems Command	Deputy Commander	BG	U.S. Army Aviation Center/School	Commander/ Commandant	MG
			U.S. Army Aviation School	Assistant Commandant	BG

Figure 2

Incumbents, If Rated, May Perform Aircrew Duties

UNIT	DUTY POSITIONS	AUTH GRADE
101st Airborne Division (Air Assault)	Commander	MG
101st Airborne Division (Air Assault)	Assistant Division Commander	BG
101st Airborne Division (Air Assault)	Assistant Division Commander	BG
172d Light Infantry Brigade	Commander	BG
III Corps	Commander	LTG
III Corps	Deputy Commander	MG
III Corps	Chief of Staff	BG
XVIII Airborne Corps	Commander	LTG
XVIII Airborne Corps	Deputy Commander	MG
XVIII Airborne Corps	Chief of Staff	BG

Colonel Assignment Opportunity: Colonels in aviation can expect maximum utilization of their technical capabilities, managerial skills and executive talents in positions of high responsibility in either of their specialties. At the colonel level we deal with three categories of aviator requirements: (1) operational flying positions, (2) positions requiring aviators that are not considered operational flying, and (3) nonaviator positions that, when the incumbent is an aviator, are considered operational flying positions. There are only seven positions in this third category. All of them are OPMS command positions – such as brigade commanders in the 101st Airborne Division (Air Assault), Ft. Campbell, KY.

There are 65 operational flying positions, including OPMS aviation commands, that require colonels. These positions are under continuous review by DA, Office, Deputy Chief of Staff for Personnel (ODCSPER). Any changes to the current list of authorized positions require DA approval.

There are roughly 40 positions that fall in the second category. These positions are subject to the normal tables of organization and equipment/tables of distribution and allowance (TO&E/TDA) changes and will vary in number. Thus, we normally will have around 100 requirements for aviators at the 06 level. To meet this requirement, we have in excess of 400 colonels currently on flight status. Roughly 85 percent of the requirements for aviators at the 06 level are within FORSCOM, TRADOC and DARCOM. Fewer than 10 percent are overseas requirements.

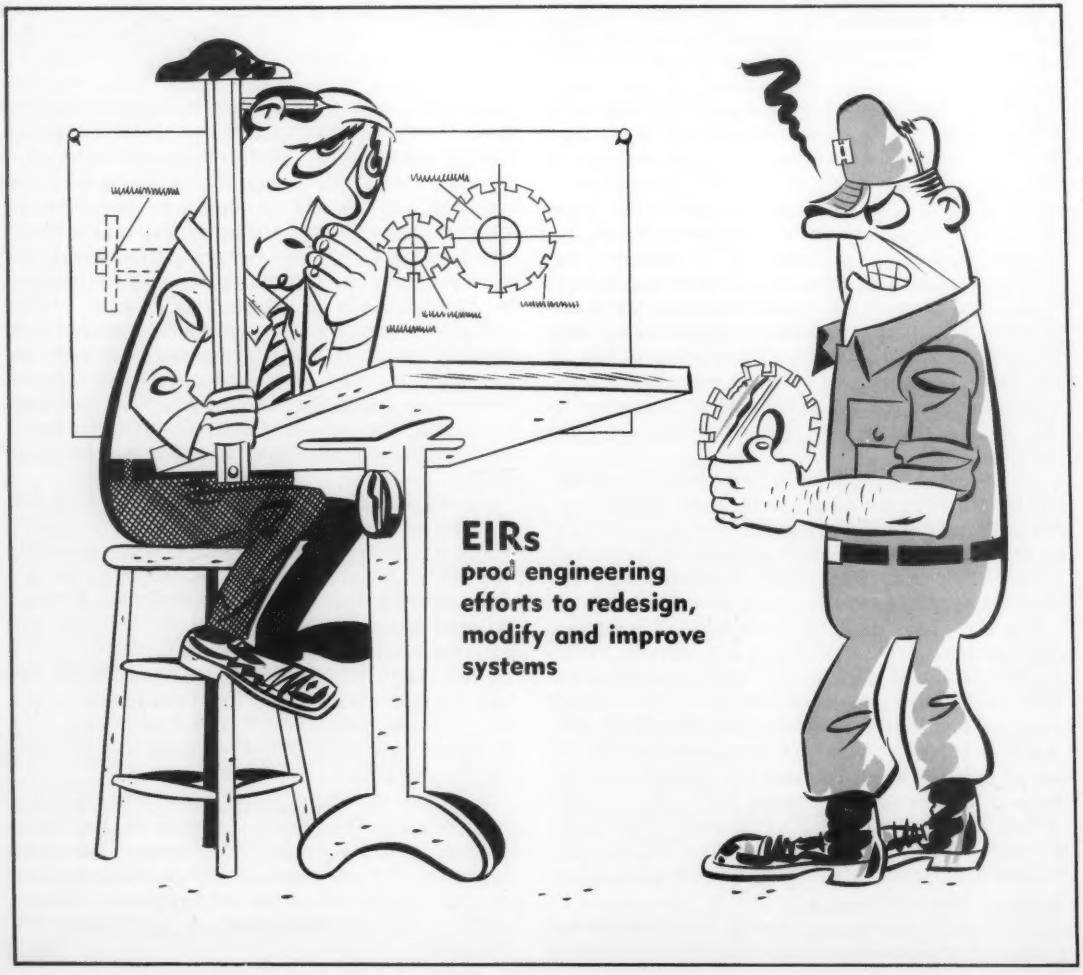
As a career specialty, Aviation provides job opportunity and professional development to support officer utilization from lieutenant level through the grade of colonel. Additionally, there are positions at general officer level which require aviators. Approved general officer operational flying positions are shown in figure 1. Incumbents may perform aircrew duties limited to the operational requirements of their position. General officers and colonels are prohibited from participation in the Combat Readiness Flying Program.

While the positions shown in figure 2 are not to be identified as requiring rated incumbents, the incumbents, if rated, may perform aircrew duties, limited to the operational requirements of their position. Such duty entitles the incumbent to flying duty credit and incentive pay, if otherwise qualified.

For the past 3 months we have addressed the personnel management aspects of aviation, primarily within the context of the OPMS Aviation specialty (SC 15). Next month we will present some professional development considerations for the Aviation Materiel Management specialty (SC 71). This will be followed by an article on warrant officer aviator management. MILPERCEN and ODCSPER are continuing to evaluate aviator training and professional development to determine if additional modifications are appropriate to keep our aviators "Above the Best."

Questions pertaining to individual officers should be directed to the career divisions of the Officer Personnel Management Directorate. Questions concerning aviator management policies should be directed to the Aviation Management Branch, ATTN: DAPC-OPP-V or call AUTOVON 221-0794/0727.

SYSTEM SAFETY AND THE EIR



Major Vincent J. Ripoll
Directorate for Technical Research and Applications
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THE AGE-OLD SAYING that an ounce of prevention is worth a pound of cure briefly but accurately describes the philosophy behind system safety; for, in its simplest form, system safety is nothing more than the application of management, science and technology towards the elimination of hazards from systems before these hazards can cause mishaps. And the first step is one of identification.

Various processes have been developed to identify problem areas for correction, and these can begin at any point in time in the life cycle of a system. However, regardless of the process, each relies on known precedents for its effectiveness. One prime source, of course, is mishap experience – not only accidents and incidents but also forced and precautionary landings. As a matter of fact, information gleaned from forced and precautionary landing experience has a special value. Not only is it reliable but also readily available for corrective actions to be developed and implemented before damage and injury producing mishaps from similar causes can occur.

But if we could have our preference, the most desirable source of precedents would be one which would identify potential hazards before they had an opportunity to jeopardize the safety of equipment and personnel. In this respect, the Equipment Improvement Recommendation (EIR) plays a most important role.

While EIRs are, of course, submitted when failures cause or contribute to mishaps of all types, they are also one of the most effective tools available for correcting deficiencies "before the fact." Maintenance and human factor as well as design problems have all been nipped in the bud because individuals submitted EIRs. Some cures were effected by changes in procedures; some, by the relocation of components; and others, by the redesign of equipment. A portion of these problems were uncovered by pilots during flight operations. Others were noted by ground personnel during the course of routine maintenance and inspections.

In one instance, inspections revealed excessive wear of the AH-1 tail rotor cable, and EIRs were submitted. These resulted in a study that showed "wet lube" used on the cable would pick up abrasive contaminants that worked their way into the lay of the cable, causing wear. The problem was resolved by removing all "wet lubricant" from the cables and spraying them with a "dry" lubricant.

In another instance, hydraulic actuator seals leaked and EIRs were submitted. As a result, new seals were developed that cured this problem. But the preparation of EIRs is not restricted to pilots and mechanics. Anyone discovering a problem or potential hazard associated with aircraft or related equipment can use the EIR to make the condition known for correction.

Furthermore, while the EIR serves as a precedent in identifying a deficiency for correction, it also serves as a precedent in pointing out a problem so that it will not be incorporated in a related system during the design phase of new equipment. As a matter of fact, EIRs long ago took their prominence among engineering efforts to redesign, modify or improve a variety of systems. As the late Henry Ford, a staunch advocate of simplicity, is reputed to have said, "The parts you leave off an automobile will never give you trouble," the problems we omit from a new system will never rise to plague us. This is the philosophy behind EIR use during the development stage of new equipment. And we have enjoyed significant results in this area – results made possible by the rapid accumulation of EIR data and facts.

Switches and controls have been relocated, glare problems reduced, and structures, such as rotor masts, strengthened. But despite the effectiveness of the current EIR program in eliminating hazards and reducing risks to health and property, much more could be done. The reason it isn't is simply because participation in the program often lacks enthusiasm.

Feelings toward the EIR vary. In some instances, dissatisfaction borders disillusionment. This often occurs when a unit experiences a rash of problems with a particular component and EIR after EIR is submitted with no solution forthcoming. In other instances, personnel fail to see why they should spend time and effort completing EIRs when the problem concerns a condition or throwaway item. Another

complaint is that often the only response received is a stereotyped statement that the reported deficiency is being entered into a statistical file. In situations such as these, a common conclusion generally arrived at by maintenance personnel is that if no solution is to be given them, then at least they should be relieved of the requirement to keep submitting EIRs on the same deficiency. After all, they are, in all probability, understaffed and have a heavy work load. Their time is valuable.

But there are two sides to every coin. What about the Directorate of Maintenance at the Aviation Systems Command (AVSCOM)? These are the people responsible for in-service engineering support of Army aircraft, including the correction of component deficiencies reported by EIRs. What about their work load? Staffing? Funds? And the work load is the only area in which overabundance abounds. Obviously, a problem that has caused or contributed to destruction of equipment and death or injury to personnel has to be dealt with immediately. Yet, AVSCOM personnel must not only determine cures for these and other less serious problems but also respond to each submission in an established manner.

The situation is somewhat like that of a school teacher in charge of 40 students. It is a relatively simple matter for each student to learn his teacher's name and be able to identify him. It is much more difficult for the teacher to learn 40 names and be able to associate a particular face with each. So, while you may represent only one unit waiting for solutions from EIRs submitted, AVSCOM is not only busily engaged in developing and providing fixes on a priority basis to units scattered all over the globe, but in addition, in preparing and forwarding a reply for each EIR received.

Picture the operation of an editorial staff of a magazine that is basically staff written but which uses two to three articles submitted by free-lance writers each issue. Every week, stacks of articles arrive at the publisher's office. Here the articles are assorted and delegated to readers who, in turn, refer any which appear promising to the editor for final approval. Finally, all the material not accepted must be prepared for mailing to the originators along with some explanatory notation. The standard method used is the rejection slip – a stereotyped reply that politely regrets the material submitted did not meet the needs of the publication. You can well imagine the additional time and money it would require to draft personal letters of explanation to each submitter.

Yet, the impersonal rejection slip does not necessarily mean the material submitted was not well written or had little value. Reasons for rejections vary: An article on a similar subject may have already been published or may be available and scheduled for publication. The subject matter might not have been appropriate for the magazine in question but may very well be in demand by another. The point is that while individual replies with detailed explanations may be desirable, they cannot always be made, and a substitute means must be used. It is somewhat the same with EIRs.

Although some of the replies may appear to be stereotyped, you can rest assured that every EIR is evaluated. One may be given the personal attention of a systems engineer; another may be evaluated by means of a computer (hence, a stereotype reply). Nevertheless, the evaluation takes place. In fact, an EIR digest is published quarterly through Army commodity commands. The digest (TB 43-0001 series) summarizes the problems submitted on DA Form 2407, and quite often, the solutions to those problems. It also spells out safety hazard warnings.

And while we may complain about the handling of our EIRs, it might be enlightening to momentarily examine an opposite point of view. Often, EIRs submitted do not provide enough technical information for making an engineering evaluation of the problem. Believe it or not, in some instances the component deficiency is not even described. Frequently, major field problems are reported by general officer correspondence instead of by EIRs, providing insufficient information for effective corrective action.

What we often fail to realize is that there exists an interdependence between "us" and "them." We need "them" to develop cures that will protect "us"; and "they" need "us" to provide enough pertinent information on a timely basis for the production of these cures. For those who may still not be aware of what actually takes place when an EIR is submitted, the following information is reprinted:

EIRs are first received at AVSCOM by the EIR Control Group located in the Directorate for Maintenance. This group assigns an AVSCOM control number and sorts EIRs by priorities (Emergency, Urgent and Routine). They are then assigned to the specific system project office re-

sponsible for the applicable aircraft. If the EIR is a quality problem or involves a publication, a copy is forwarded to either the AVSCOM Directorate for Product Assurance or the Technical Publications and Maintenance Data Division in the Directorate for Maintenance. Meanwhile, all EIRs are microfilmed and an acknowledgement prepared and released to the sending activity. The copy of the EIR retained in the EIR Control Center is then used for key punching the EIR information into the automated data bank program. This data bank is used for establishing failure rates, reliability levels and justification for product improvement.

Maintenance and human factor as well as design problems have all been nipped in the bud because individuals submitted EIRs

While all this is going on, the maintenance engineer in the specific aircraft system project office is evaluating the EIR, based on its priority and its content to determine the following:

- If the EIR contains sufficient information to determine the necessary corrective action.
- If any previous feedback data shows a similar deficiency and what corrective action was taken.
- If a case has already been established for the reported problem.
- If a computer reply is available for an immediate answer.
- If the priority is properly assigned in accordance with TM 38-750. (If the priority is not correct, it is changed to the proper designation).
- If the information in the maintenance manuals, as well as in past EIR Digest entries, are adequate for the reply. (Many EIRs submitted are found to have been previously answered by EIR Digest entries. EIR Digests on aircraft are available in the field and are updated quarterly.)

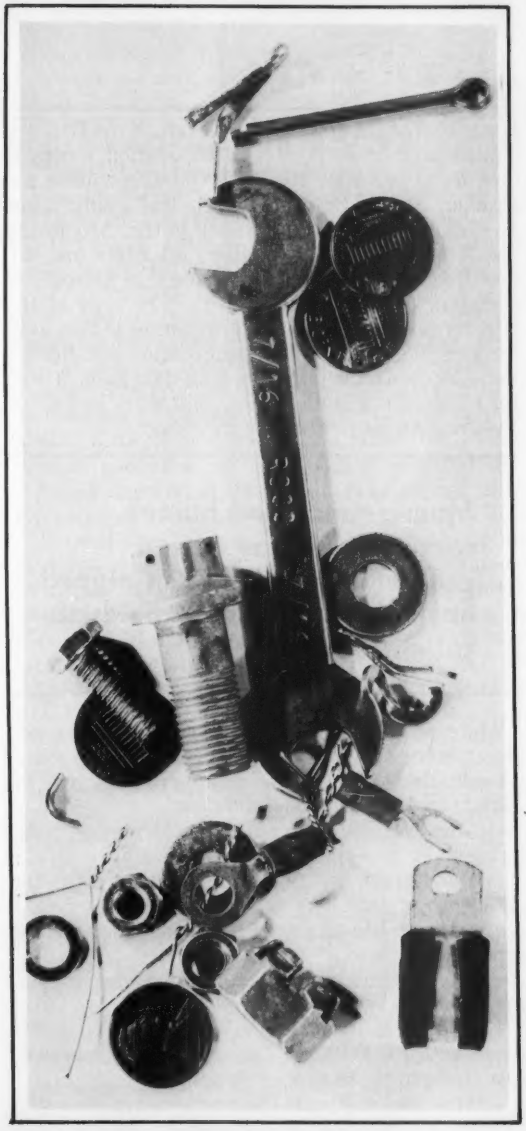
If sufficient information and feedback historical data are available, a reply is prepared and forwarded to the EIR Control Group for release. EIR replies are entered in the data bank and concurrently released to the preparing field activity. To ensure responsiveness and management control of all EIRs, flasher monthly reports are required on the quantity of open EIRs on hand from all system offices. These reports are cross-checked with the log in the EIR Control Center. The entire processing time for the EIR to be received at the AVSCOM EIR Control Center, logged in and placed in the maintenance engineering action office is less than 2 hours. This does not mean that you are going to get answers within 2 hours, but it does indicate an accurate control and procedure for recording the time required to respond to EIR inputs have been established.

The need for obtaining accurate failure data from user activities, including individual analysis of failed parts, cannot be overemphasized. A full description of the physical aspects of the failure is important for tracing possible failure modes or trends. The time since new and time since overhaul are also important in terms of determining time between failures. Circumstances prior to the difficulty sometimes provide positive clues as to what might have caused a failure. The lack of this type of information generally results in extensive delays in providing EIR replies.

And, yes, it is important to submit EIRs on condition or throwaway items. If a seal, for example, is failing during its expected life span and no EIRs are submitted, no effort will be made to redesign it. The same applies to bearings, bushings, actuators, etc. Consequently, we can become stuck with a perpetual problem item.

Let's not lose sight of the primary purpose for submitting EIRs – to initiate early and effective corrective actions. This is precisely the very principle of system safety. In many instances, EIRs were the first measures taken to correct design features that had previously resulted in injuries and equipment losses. While the EIR is specifically required if a defect or malfunction would result in serious damage or would create or cause an unsafe condition or a definite hazard to personnel, its preparation is not limited to these conditions.

EIRs can be submitted by *anyone* who detects failure of equipment, receives defective components, or simply wants to recommend improvement in materiel that could render an item, system or subsystem inoperable. And *anyone* includes the general mechanic, the supply clerk, the aircraft crew ... In short, the submission of EIRs belongs to all of us. Let's take advantage of this potent and proven tool.



FOD - Still A Problem

Ted Kontos
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U.S. Army Agency for Aviation Safety

FROM 1 January 1968 through 30 January 1974, more than 17,500 T53 engines were removed for overhaul. Teardown analysis revealed that more than one-fourth (4,773) of these had sustained foreign object damage, and had it not been for FOD, they could have remained in service their full TBO time. Based on the 1972 average cost of overhaul,

premature removal of these engines resulted in a cost of more than $62 million.

During the period 1 January 1970 to 30 September 1976, FOD either caused or contributed to 426 mishaps. These resulted in 4 fatalities, 68 injuries, and the destruction of 8 aircraft. Damage costs exceeded $5 million.

In the past, we have usually associated FOD primarily with engines and in certain instances with aircraft structures. However, FOD is not confined to these two areas. It often involves individual aircraft systems or components. For example, the pilot of a U-8F smelled smoke after he retracted the gear following takeoff. Almost immediately the electrical system failed. Inspection revealed that various hardware items, including pieces of sheet metal and safety wire left in the vicinity of the voltage regulator, had caused an electrical short. Another U-8 pilot was unable to reduce power below 25 inches Hg on the No. 2 engine. The throttle mechanism was found jammed by a piece of exhaust gasket in the cowling.

A third instance involved a UH-1H. After shutting down the engine, the crew noticed smoke coming from the transmission compartment. Burning material was found in the lower aft avionics compartment. The pilot pulled the material out with his hands after two fire extinguishers failed to operate. Finally, a third extinguisher was used to put out the fire. Investigation revealed it was started by a piece of .032-inch safety wire lying across a terminal board at the ARC/102 radio mount. When power was applied, the safety wire became hot and ignited aircraft technical manuals that were stored in the compartment. In addition to the TMs, an engine inlet cover, engine exhaust cover, a length of nylon rope, and a rag were present. Damage caused by the safety wire cost nearly $18,000 and required 3,300 man-hours to repair.

Another type of FOD we should not overlook concerns contaminants, particularly those associated with fuel, oil, and hydraulic systems. While we usually do not consider contamination an FOD problem, it is in reality nothing more than foreign objects, or substances, within a system. These can readily cause hydraulic systems, transmissions, gearboxes and engines to fail, and can produce mishaps. The principal difference between this and other types of FOD is simply one of size. If the damage-producing agents are minute, we refer to them as contaminants; if they are large, we call them foreign objects.

One instance of contamination involved an OH-58A. During low-level flight, the engine-out light and audio warning systems activated, and the aircraft struck the ground. Foreign matter in the fuel system caused the fuel pump to fail and the engine to quit. This accident resulted in two minor injuries and the destruction of the aircraft.

Numerous precautionary and forced landings have also resulted from water and sediment in aircraft fuel systems. After one such mishap involving a UH-1, analysis indicated the fuel sample contained 60 percent water. Investigation revealed the fuel tanker was contaminated with water. Apparently, neither a daily inspection had been performed on the vehicle nor a fuel sample taken.

Obviously, we need to correct our bad habits and need to do so now; for any not corrected most assuredly will be carried forward into a combat situation should one develop. Then we will find we have two adversaries to flight: the enemy and ourselves.

Mishaps resulting from airframe FOD can often pose a greater threat to safety than those caused by engine FOD. Airframe failures usually occur without warning and affect aircraft controllability. Consider the UH-1H that was in level flight when a loud bang was heard and tail rotor control was lost, causing the aircraft to crash. The engine inlet cover which had been left on the roof of the aircraft during preflight struck a tail rotor blade, causing the tail rotor, 90-degree gearbox, and a portion of the drive shaft to separate from the aircraft. Damages exceeded $74,000 and required more than 1,700 man-hours for repairs. In other instances, rain jackets and plastic-covered tactical maps have caused mishaps that resulted in damages in excess of $210,500 and entailed more than 4,000 man-hours for repairs.

Handtools and other items associated with toolboxes are a common source of FOD. During the period 1 January 1970–31 July 1976, common handtools or items that can be associated with toolboxes were identified as cause factors in 41 mishaps. Costs for repairs exceeded $210,000 and 7,000 man-hours.

Tools included deep well sockets, pliers, wrenches, flashlights, socket wrench extensions, screwdrivers, breaker bars, metal rulers, ratchets, mallets, and even a bucking bar. They were found in places such as engines, gearboxes, tail rotor drive shafting tunnels, control tubes, and tail rotor silent chain assemblies. Related items that caused FOD included paint brushes, paper towels, rags, pencils, and a roll of safety wire.

While geographic location and topography play a role in FOD, most of the mishaps that result from environmental cause factors can be avoided by proper inspection procedures and preventive measures.

Following are some of the most common deficiencies:

- Failure to clean around engine inlets and decks

following maintenance.

- Failure to ensure adequate tool control.
- Lack of supervision.
- Failure to follow accepted maintenance and inspection procedures.
- Use of unqualified personnel.
- Lack of an effective Army-wide foreign object damage prevention program.
- Deficiencies present in aircraft design.
- Failure of flight crew to follow published procedures.
- Failure to ensure practice LZs, runways, and landing pads are kept free of debris.
- Failure to securely anchor marking panels.
- The storage of items in unauthorized areas of an aircraft.

While some FOD may be inevitable, particularly in situations where aircraft are operating in unimproved LZs, we can prevent FOD in most instances. Consider, for example, the mishaps in which tools were involved. All could have been prevented had an effective tool control program been in operation, proper supervision exercised, and thorough inspections accomplished.

What can be done to curtail FOD mishaps? Following are some steps that will help ensure safety from FOD:

1. Make certain all maintenance is performed properly – BY THE BOOK. This includes making sure excess grease is removed after components are lubricated and that adjacent areas are free from oily deposits that can cause dirt buildup. All oil and hydraulic fluid containers should be cleaned before being opened, and all disconnected lines capped with approved materials. These include plastic caps or plugs, fuel- and oil-resistant paper, or aluminum foil taped in place. NOTE: Tape should not be used alone as the adhesive may dissolve and contaminate the system.

2. Make certain work areas on aircraft and deck walkways are cleared of litter, pebbles, etc., after maintenance has been completed. Should an item be dropped, make certain it is located. If the individual involved cannot find it, he should report the matter and the item accounted for before the aircraft is operated.

3. Police the ground around the aircraft after maintenance and place litter in appropriate containers. Never rely on a mechanical sweeper to do this job. While a sweeper is a useful aid, it cannot do the job alone.

4. Following maintenance, perform an inventory of tools used. Avoid relying solely on a visual inspection of the work area. Sometimes tools are difficult to spot as the color of some tools blends in with the background.

5. Make certain all cargo is anchored before flight and baggage is secure in designated compartments.

6. Perform thorough preflight inspections, ensuring cleanliness of cockpit area and floor. Depending on aircraft configuration, small items such as paper clips can be blown out of the aircraft and drawn into the engine inlet.

7. Ensure that the engine inlet covers are removed and securely stored. Check the engine inlet area for signs of foreign objects.

8. Ensure all passengers are thoroughly briefed concerning the hazards associated with operating aircraft. Throwing items out of operating helicopters has caused numerous accidents and incidents.

9. Avoid hovering or flying aircraft at extremely low altitudes over sandy areas or over terrain covered with loose foliage. If missions require this type of operation, closely monitor engine instruments and inspect engine inlets frequently.

10. Familiarize yourself with any special FOD hazards that may be peculiar to your geographic area. Is it a natural habitat of wild fowl? If so, locate and avoid areas where birds roost, and be especially cautious during migratory seasons.

11. Ensure marker panels are securely anchored.

12. Make certain all personnel are familiar with your FOD prevention program.

13. Be sure to include FOD topics in your safety briefings.

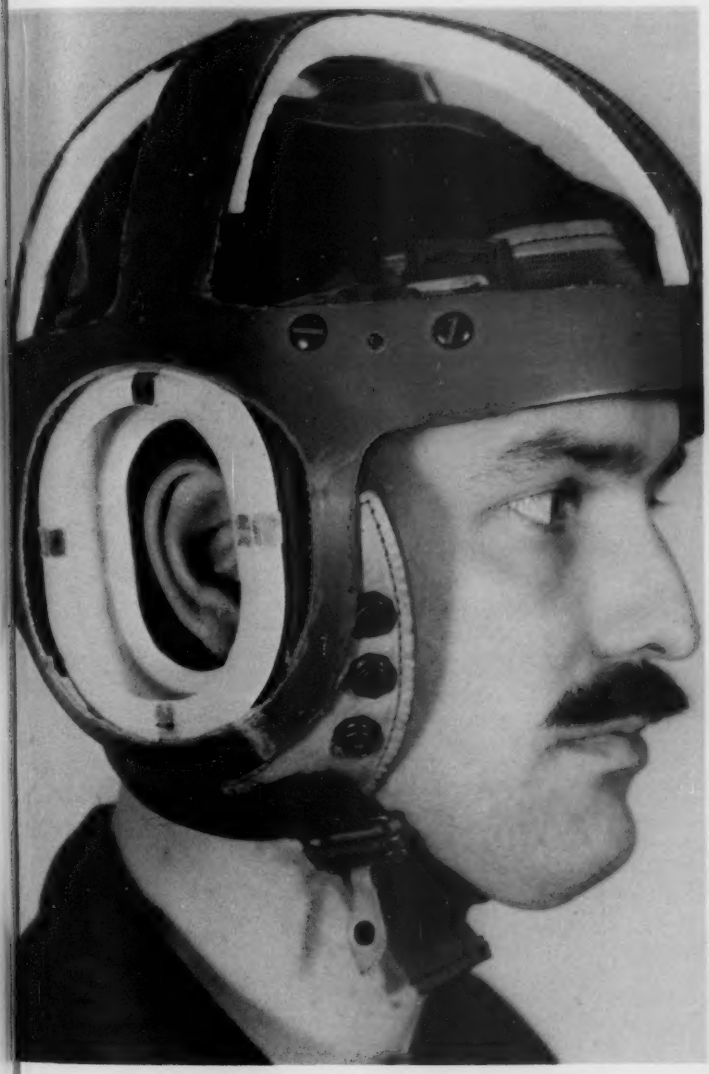
14. Place FOD posters and other instructional material in conspicuous areas to serve as constant safety reminders.

If, after all precautions have been taken, FOD should occur, every effort should be made to determine the cause so that effective corrective actions can be developed to prevent damage from similar causes.

FOD is still with us and is still a problem. Further, it is a most deceptive one in that it often accomplishes its dirty work without causing mishaps. The number of engines that have had to be changed because of FOD can readily attest to this fact. Operating in a discreet manner, it stays out of the limelight, attracting little attention to itself. But let's not be deceived by its tactics. It is a costly and potentially dangerous varmint that should be destroyed. While we may not be able to do this, working together we can, at least, keep it safely at bay.

For more information on FOD control, contact SFC Jerry E. Mills, AAA&I, USAAAVS, AUTOVON 558-3913/3901, commercial (205) 255-3913/3901.

Cutaway view of SPH-4 helmet



THE DIFFERENCE!

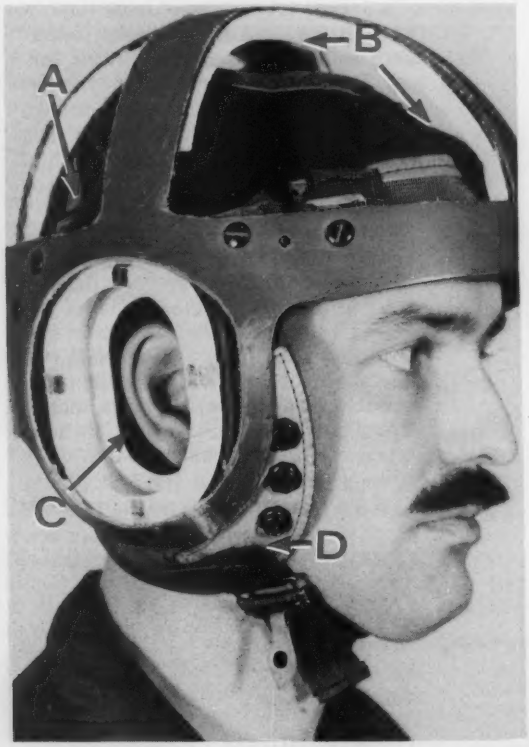
AS THE HUEY came in to land, it turned to the right of the runway centerline, touched down, and ran off the runway. Becoming airborne again, the aircraft went into an extremely nose-high attitude, then yawed to the right in a nose-low attitude, fell through, and crashed. It skidded about 10 feet and came to rest inverted.

By all accepted standards, this crash was survivable. Yet, the pilot was killed while the copilot escaped with only minor injuries. One factor made the difference between life and death in this case. The pilot, who made a habit of wearing his helmet with the chin and nape straps very loose, lost his helmet on impact and was killed when his head struck the instrument panel. The copilot's head also hit the instrument panel but his helmet protected him even

Although the crash was survivable, the pilot of this Huey was killed when he lost his helmet

though the force of the blow fractured the helmet shell and crushed the foam liner. The copilot later lost his helmet from failure of the chin strap assembly due to deterioration of the leather binding coupled with the G forces. However, he had the chin and nape straps tight enough to prevent helmet loss when it counted the most – on initial impact.

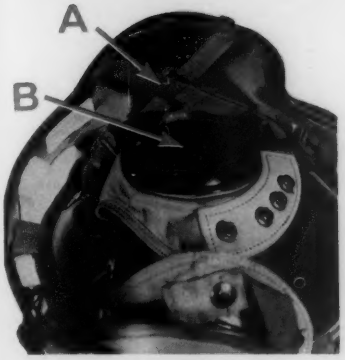
The prevention of fatalities like this is straightforward. It's simply a matter of making sure your helmet fits right. Snugly adjust the chin and nape straps and *do not use a chin pad.* Always snap the chin strap in the lowest fitting. The



Above: A cutaway view showing properly fitted helmet. (A) Properly adjusted crown straps. (B) Adequate airspace between top of head and crown pad. (C) Correct position of earcups. (D) Chinstrap fastened to the lowest snap fitting

Right: Earcup properly fitted to depression immediately below ear

Below: Snugly adjust nape strap by pulling on strap. Ensure this is done each time the helmet is donned



Left: (A) Cross-web straps for controlling earcup tension
(B) Back of earcup to which self-adhering spacer pad should be attached if needed.

Below right: With helmet on the floor, center crown pad and check for equal tension of crown straps by applying pressure with the fist

Above: For stability and retention, tighten headband suspension strap until snugly fitted around the head

upper snap fittings are used only with an oxygen mask. A forward crash force rotates the helmet upward at the back of the head, and a loose chin strap permits more rotation and exposes more of the neck and skull. The violent rebound which follows the forward crash force causes the head to move rearward and downward, exposing the back of the head to injury. A loose nape strap also permits the helmet to rotate and move up at the back of the head in a like manner to the loose chin strap.

When you put on your helmet, make sure the earcups fit the depression immediately below the ears to provide a good seal. Often the seal is lost by loosening the cross-web straps located between the earcups. However, when the helmet's sling suspension is adjusted properly and the earcups are in the correct vertical position, a good acoustical seal is possible without being uncomfortable. If you find that the vinyl earcups are too loose even though the cross webbing is tight, a spacer kit of self-adhering compressed foam furnished as part of the helmet can be used to increase earcup pressure when additional compression is required. This foam should be applied on the back of the earcup – not on the front. Height of the helmet should be adjusted in relationship to the earcups, making sure the ears are comfortably enclosed by the cups. If the helmet rides too low or too high on the head, the crown straps should be shortened or lengthened. To prevent hot spots on the head, always check the large crown pad to make sure it is dead-centered and that an equal amount of tension is on each strap. Next, adjust the headband suspension strap until it fits snugly around the head in order to obtain maximum retention and stability of the helmet.

In addition to being properly fitted, your helmet must be properly maintained. In this case, one of the reasons the copilot lost his helmet was deterioration of the leather binding. Components of the helmet should be inspected frequently. The foam liner should always be intact and all fasteners secure. If parts appear frayed, worn, or deteriorated, they should be replaced. For example, the vinyl earpads which fit next to the skin and attach to the earcups were designed to be soft and flexible to facilitate an airtight seal around the ears. Over a period of time, the plasticizers in the vinyl evaporate and cause the pads to harden. Apparently, perspiration or body oils and some types of hair dressing react with the pads to cause this evaporation. This hardening process may occur within 6 months. In any event, hardened pads must be replaced.

Keep your helmet dry and clean and never use it as a stool or for stowage. The sharp edges of a stowed clipboard can penetrate or crack the styrofoam liner, thus reducing its energy-absorbing capability. Always stow the helmet in the helmet bag and should the liner become damaged, have it replaced in accordance with TM 10-8415-206-13.

When carrying the helmet, be sure it's in a carrying bag with the mike boom pivoted inside the helmet. Never use the mike boom, the cord, nape strap, or chin strap as a handle. Keep your communications system in good working order and protect the plug and socket against mechanical damage, dirt, and water.

Some aviators make a habit of borrowing survival equipment or flying without it rather than getting their own. Several actions can be taken to stop these unsafe practices.

First, commanders, assisted by their ASOs, should inspect their troops on a periodic basis to make sure everyone has the necessary life support and survival gear, that it is being used and worn on all flights, and that it is being maintained.

Second, commanders should assure that unit flight surgeons are present during these inspections to properly supervise and inspect the fitting and use of personal safety equipment.

Last, but not least, crewmembers should learn to properly fit the helmets themselves. For more information on the helmet fitting, contact MAJ Ronny E. Porta, Directorate for TR&A, USAAAVS, Ft. Rucker, AL 36362, AUTOVON 558-3493/4812, commercial (205) 255-3493/4812; or SSG Gerald L. Johnson, Bioengineering and Life Support Equipment Division, USAARL, Box 577, Ft. Rucker, AL 36362, AUTOVON 558-7112, commercial (205) 255-7112.

For more information on fitting and maintenance of the SPH-4 helmet, contact LTC David H. Karney, Medical Division, USAAAVS, AUTOVON 558-6788/3819, commercial (205) 255-6788/3819.

A video tape produced by the U.S. Army Aeromedical Research Laboratory on fitting and care of the SPH-4 helmet is now available, and program copies can be procured from the U.S. Army Aviation Center, Educational Television Division, ATTN: ATZQ-TD-ETV, Fort Rucker, AL 36362. When requesting copies, send one blank ¾-inch video tape cassette for each program with the following information: Program No.: ## -2C-011-0693B; Title: SPH-4 Aviator's Protective Helmet; Running Time: 22 minutes.

PEARL'S

Personal Equipment & Rescue/Survival Lowdown

If you have a question about personal equipment or rescue/survival gear, write Pearl, USAAAVS, Ft. Rucker, AL 36362

EIRs Do Work

Does your Nomex ravel? Are you embarrassed by zippers that won't stay zipped? You say your new flight jacket has minipockets and your penlight won't fit anyplace in the thing? Are the cuffs fraying and the color fading? Are your survival rations dated 1966? Does your A-13A oxygen mask fail at flight level 250?

If you have these or any other problems with aviation life support equipment, you should submit an EIR (DA Form 2407). Your buddies did and all of the items mentioned above are in the process of being improved, changed, or in some instances completely redesigned. This is not to say that more changes can't be made in the same items, so send those aviation life support EIRs to: Commander, U.S. Army Aviation Systems Command, ATTN: DRSAV-WL, P.O. Box 209, St. Louis, MO 63166. And send Pearl a

copy so that if you do not get a reply from the responsible agency within a reasonable time, we can follow up on the EIR when requested.

Cold Weather Survival Kit and Nomex Underwear

This unit recently participated in the Jack Frost 77 exercise conducted near Fairbanks, Alaska. During this exercise, two separate incidents necessitated aviators being placed in a survival situation. In both instances the cold weather survival kit, NSN 8465-00-973-1862, was determined to be inadequate. Although temperatures and conditions were mild for the time of year, the following discrepancies were discovered:

- *The sleeping bag did not provide adequate protection. Had the temperature been more severe or seasonably normal, i.e., to -40 degrees F., or had a person been injured, frostbite would certainly have occurred. Also, the sleeping bag container had to be cut open. Here again an injured person may not have been able to use the bag. The Air Force has modified the container to include a rip cord device which greatly eases the effort required to open the container.*
- *The fuel, compressed, trioxane, should be replaced with a small mountain-type stove. The burning time of the fuel tabs is too short and not enough heat is generated for melting snow, cooking, or providing warmth.*
- *The requirement to carry a survival kit on board the aircraft for each occupant is an unnecessary duplication of most items contained in the kits. Due to the limited space and weight capabilities of this unit's OH-58 aircraft, recommend that latitude be given to units to configure a kit, permanently installed in the aircraft to accommodate a standard load of one pilot and two passengers. This would allow a tremendous weight reduction and increase the payload of the OH-58.*
- *A shelter is desperately needed to supplement the survival kit. In the interior of Alaska, often there are severe temperatures and little or no snow or foliage to fabricate emergency shelter. A lightweight 3-man mountain tent (privately owned) was used in both instances and was an invaluable asset to the individuals concerned.*
- *Additionally, most aviators have purchased a body warmer which is an excellent item of personal and/or survival equipment. It may be worn on the person or used inside the sleeping bag. It is fueled by a charcoal type briquette which lasts for 6 to 8 hours without replacement.*
- *Although there was no direct confrontation with Alaskan wildlife, the need was identified for a standard survival weapon. Both situations occurred in areas of wolf and bear concentrations. Additionally, Alaskan state law requires survival weapons be on board civil aircraft on all cross-country flights.*
- *Rations presently included in the survival kits are dated 1963 and 1966. I can find no shelf-life requirements for the rations. The Air Force has destroyed all like rations manufactured prior to 1974. Request clarification of the shelf-life requirements. Also, a more practicable survival ration is the LRRP or similar freeze-dried ration. There is less bulk and weight involved in addition to being easier to use. And the quality appears to be much better.*

Understandably there have been many recommendations concerning survival and cold weather equipment necessary for operating within the Alaskan environment and other cold weather regions. However, there have been no noticeable improvements in these areas for the past several years.

Before Jack Frost 77, Nomex underwear was located through Air Force supply channels at Elmendorf AFB. However, after checking through Army channels, I was told that these were not Army-adopted items and could not be procured. I think this underwear should be made readily available to all Army aviators stationed in selected cold weather regions. At the present time, Army aviators are routinely purchasing, at their own expense, necessary thermal underwear and other cold weather equipment necessary to cope with the Arctic environment.

Your comments concerning the cold climate survival kit have a great deal of merit. Copies of your letter were sent to the aviation life support equipment (ALSE) project manager at USAAVSCOM, St. Louis, MO; the U.S. Army Natick Research and Development Command, Natick, MA; and the U.S. Army Aeromedical Research Laboratory (USAARL) and Combat Developments, both located at Ft. Rucker, AL. Representatives of these

activities participated in a joint working group at Natick in February, at which time development requirements were submitted for a heavyweight flying glove and a cold weather flying ensemble.

The ALSE project manager should be notified of any ALSE discrepancy by the submission of an EIR, with a copy sent to Commander, USAAAVS, ATTN: IGAR-TA, Ft. Rucker, AL 36362. The EIR is a valuable tool in identifying the need for product improvement. Documentation is required to justify the expense of improvements. The address for the ALSE project manager is Commander, USAAVSCOM, ATTN: DRSAV-WL, P.O. Box 209, St. Louis, MO 63166.

The suggestion program is another valuable tool used in adopting items of aviation life support equipment. An example is the addition of the space blanket to the survival vest.

Thermal tests conducted at USAARL showed that winter underwear, 50% cotton and 50% wool, worn under Nomex, provide fire protection equal to Nomex underwear. The wool/cotton material also absorbs perspiration, a critical asset in cold weather. For these reasons, Nomex underwear has not been adopted for Army use.

SRU-21/P Survival Vest

The SRU-21/P survival vest, NSN 6230-00-401-2285, is apparently made of nylon, and when worn over the Nomex shirt I would think negates any fire protection which the shirt would provide. Could you tell me if any tests have been conducted on this vest in relationship to fire survivability?

Also, the bulges and open weave which characterize the vest appear to be inherent hazards in leaving an aircraft crash. That is, it seems that wearing this particular vest could impede or even prevent an individual from escaping a crash due to the bulging pockets and the open net of the vest which could easily become snagged on various parts of the aircraft. Have any studies been conducted to determine if this does constitute a hazard?

I am interested in knowing whether the survival vest is an aid or a hazard in a crash situation. If your aircraft crashes and does not burn, it seems an easy matter to return to the aircraft and remove the survival equipment. If your aircraft does burn, you are quite likely to find the nylon survival vest melted into your body, which does little to aid in survival. And, finally, if you should escape the post-crash fire with the vest intact, there is little if anything which is helpful to you unless you are, of course, in an isolated area.

Review of the aircraft mishap data base indicates no reported instances where the SRU-21/P survival vest caused or contributed to the severity of thermal injuries. Tests conducted by Natick Laboratories indicate that the thermal injury potential of nylon material is slight when worn *over* the Nomex flight uniform. Incidentally, the same vest is used by all services.

The survival vest is a definite aid in a survival situation. There is substantial evidence to indicate that injury complications and even death have resulted due to the lack of survival equipment. In two reported cases, the crashes occurred within 2 miles of an airfield or a populated area.

Stowing of the survival vest is not recommended. A stowed survival vest does not ensure availability because injury to an individual may prevent its retrieval. The crash, particularly should fire occur, has the potential of destroying or damaging the components.

ATC action line

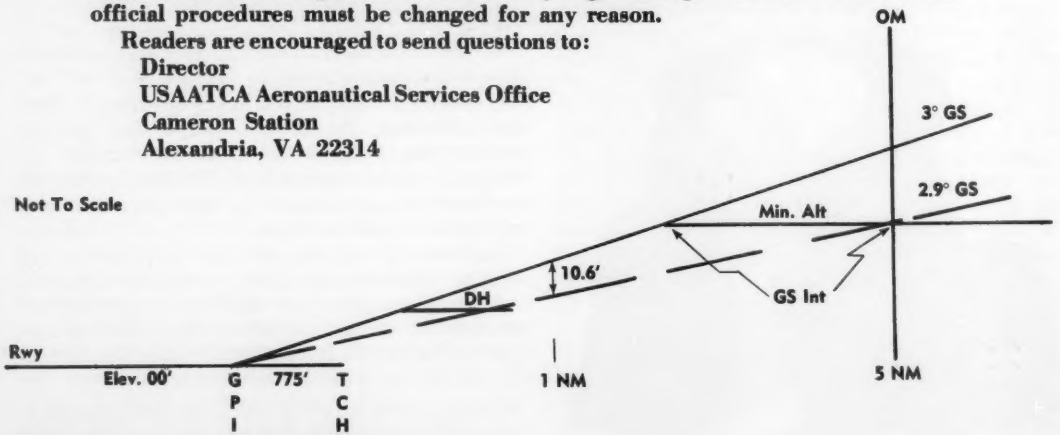
UNITED STATES ARMY AIR TRAFFIC CONTROL ACTIVITY

WHAT ARE SOME of the side effects of raising a commissioned precision approach radar (PAR) or instrument landing system (ILS) glide slope (GS) from 2.9 degrees to 3.0 degrees?

Very little as regards the flyability of the procedure. Considerable when the procedures, charts, flight information and legal aspects are examined. Such movement elevates the slope 10.6 feet at 6,076 feet (1 nautical mile) from the GS ground point of intercept (GPI). Glide slope point of intercept may move to a point in front of the outer marker (OM). Threshold crossing height (TCH) increases a proportional amount. Position or height of certain radar reflectors becomes involved for PAR. Flight check is required to assure the slope is as advertised in flight information publications (FLIPs). When any data is changed, advance information is required (except for emergency or safety) so that Department of Defense (DOD) and civil procedures can be printed and distributed to coincide with the effective date of change. Except for safety reasons, no change in instrument procedures or associated data should be accomplished until all coordination actions are accomplished. AR 95-50, "Procedural Service," and TM 95-226, "Terminal Instrument Procedures — TERPS," contain criteria and guidance for officers responsible for procedural data. Consult with local U.S. Army Communications Command activity, airspace and air traffic officers or Department of the Army regional representative offices when official procedures must be changed for any reason.

Readers are encouraged to send questions to:

Director
USAATCA Aeronautical Services Office
Cameron Station
Alexandria, VA 22314



TCH + 1.14'
1 NM + 10.6'
DH no elev change
DH closer to thld

Glide slope intercept
Forward of OM
Descent rate increased
LOC no change

Senior Nonresident Course

OUTSTANDING active Army, Reserve and National Guard senior noncommissioned officers can take a giant leap forward in the NCO education system by taking the challenging nonresident course of the Sergeants Major Academy, Ft. Bliss, TX.

Successful completion of the 2-year nonresident course counts equally in competition with senior NCOs who complete the 22-week resident course.

Recent changes in selection requirements allow promotable active duty sergeants first class (E-7) to apply for the nonresident course.

All selections for the nonresident course will be determined by a special panel at Department of the Army.

Another significant change in the program is that applications will be returned to those not selected with instructions to reapply next year if still interested. This will ensure the selection board has the benefit of the most current information for each applicant and reaffirms the applicant's interest.

Students are required to attend a 2-week resident session prior to graduation.

The course emphasizes leadership and human relations, resource management, military organization and world studies. A significant segment of the nonresident course is the requirement for assignments answered on audio tape.

The U.S. Army Sergeants Major Academy is accredited by the Southern Association of Colleges. Many colleges recognize up to 18 semester hours of undergraduate credit for completion of the course.

Active Army personnel may apply by letter through channels to: Commander, MILPERCEN, ATTN: DAPC-EPZ-HA, 2461 Eisenhower Avenue, Alexandria, VA 22331.

Army Reserve personnel should apply on DA Form 145 through channels to: HQDA, ATTN: DAAR-OT, Washington, DC 20310.

Army National Guard personnel should apply on National Guard Bureau (NGB) Form 64 through channels to: Army National Guard Schools Branch, ARNG Operating Activity Center, Building E4430, Edgewood Area, Aberdeen Proving Ground, MD 21010.

New Aviation Correspondence Courses Available

The Aviation Command and Resource Management Correspondence Course (ACRMC)

Air Operations (CMF-64) Primary Technical Course MOS 71P (Provisional)

Air Operations (CMF-64) Basic Technical Course MOS 71P (Provisional)

Air Operations (CMF-64) Primary Technical Course MOS 93H (Provisional)

Air Operations (CMF-64) Basic Technical Course MOS 93H (Provisional)

Air Operations (CMF-64) Primary Technical Course MOS 93J (Provisional)

Air Operations (CMF-64) Basic Technical Course MOS 93J (Provisional)

Have you been assigned as an aviation unit commander? If you are a captain or above in the active Army or reserve component, you may be eligible to enroll in the Aviation Command and Resource Management Correspondence Course which will prepare you for duties as a unit commander of an aviation company/air cavalry troop or aviation battalion/air cavalry squadron, or an operations or executive officer.

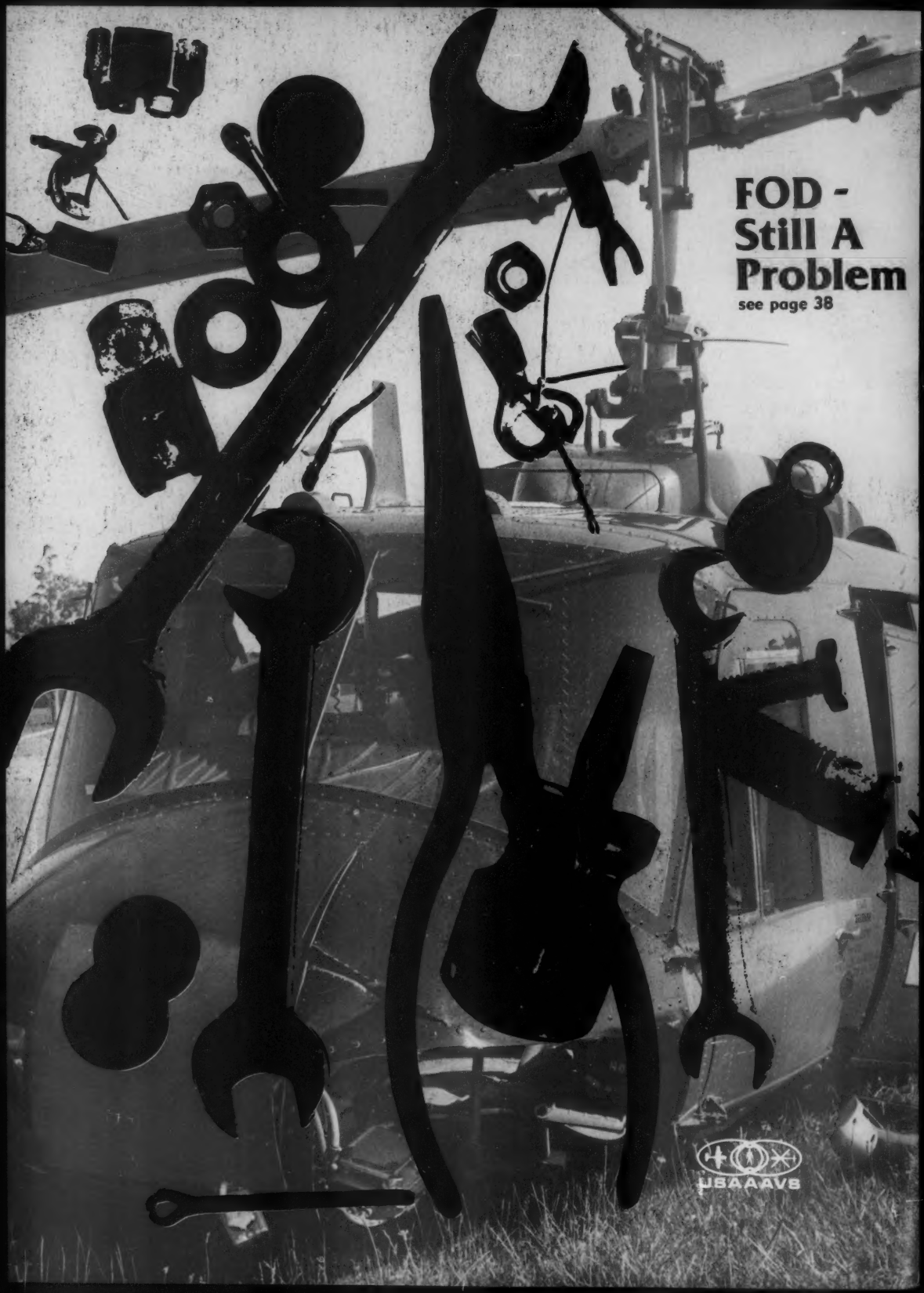
If you are in CMF-64 with an MOS of 71P10, 93H10 or 93J10, you may enroll in the appropriate Primary Technical Course which will provide you with some of the information required to perform duties at skill level 2. If your MOS is 71P20, 93H20 or 93J20, you may enroll in the appropriate Basic Technical Course which will provide you with some of the information required to perform duties at skill level 3.

To enroll in any of the above correspondence courses, submit a DA Form 145. If you desire more information pertaining to the above courses, write:

Commander
U.S. Army Aviation Center
ATTN: ATZQ-TD-CD-ET
Ft. Rucker, AL 36362

or call

Commercial 205-255-6490
AUTOVON 558-6490


FOD -
Still A
Problem
see page 38
UBAAAVS